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INTERNATIONAL PACIFIC SALMON FISHERIES COMMISSION

APPOINTED UNDER A CONVENTION
BETWEEN CANADA AND THE UNITED STATES FOR THE
PROTECTION, PRESERVATION AND EXTENSION OF
THE SOCKEYE AND PINK SALMON FISHERIES IN
THE FRASER RIVER SYSTEM

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ANNUAL REPORT

1961

COMMISSIONERS

SENATOR THOMAS REID
A. J. WHITMORE
W. R. HOURSTON
DeWITT GILBERT
CLARENCE F. PAUTZKE
GEORGE C. STARLUND

NEW WESTMINSTER
CANADA
1962

INTERNATIONAL PACIFIC SALMON FISHERIES COMMISSION

MEMBERS
AND PERIOD OF SERVICE
SINCE THE INCEPTION OF THE COMMISSION
IN 1937

CANADA	
William A. Found	1937-1939
A. L. Hager	1937-1948
Senator Thomas Reid	1937-
A. J. Whitmore	1939-
Olof Hanson	1948-1952
H. R. MacMillan, C.B.E., D.Sc.	1952-1956
F. D. Mathers	1956-1960
W. R. Hourston	1960-

UNITED STATES	
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	1957-1957
B. M. Brennan	1937-1942
Charles E. Jackson	1937-1946
Fred J. Foster	1943-1947
Milo Moore	1946-1949
	1957-1961
Albert M. Day	1947-1954
Alvin Anderson	1949-1950
Robert J. Schoettler	1951-1957
Elton B. Jones	1951-1957
Arnie J. Suomela	1954-1961
DeWitt Gilbert	1957-
Clarence F. Pautzke	1961-
George C. Starlund	1961-

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DIRECTOR OF INVESTIGATIONS
LOYD A. ROYAL

NEW WESTMINSTER
CANADA
1962

FIGURE 1—Newly completed Sweltzer Creek Field Station located near Cultus Lake. The laboratory will provide facilities for research on the tolerance limits of sockeye and pink salmon to possible environmental changes due to natural fluctuations, potential flood control, power development and pollution.

REPORT OF THE
INTERNATIONAL PACIFIC SALMON FISHERIES COMMISSION
FOR THE YEAR 1961

The sockeye run to the Fraser River in 1961 was a disappointment to both the fishing industry and the Commission. While the total pack was the third highest for the cycle year since 1917, the basic potential of the run was much greater than that which occurred. The known productivity in fresh water, if followed by average survival in the sea, could have resulted in a run of several million more fish than actually returned. Since record cyclical runs occurred in 1958, 1959 and 1960, a good run in 1961 would have restored quadrennial production close to those levels existing before the Hell's Gate slide in 1913.

The failure of the 1961 sockeye run to approach normally expected numbers raises an important question as to whether this failure was due to errors in management of the fishery or to unusual natural conditions beyond control. Fortunately, the Commission has available a large amount of information on Fraser River sockeye and critical analysis of these data has made it possible, by the process of elimination, to fix the approximate period in the fish's life history when adverse influences had their effect on the 1961 run.

In 1957, the brood year, a total of 1,341,000 sockeye—four years old or older—was recorded on the spawning grounds of the Fraser River. The spawning population in 1957 was the largest of the cycle year since at least 1917 and possibly since 1913. Moreover, the 1957 escapement was probably the most effective in this cycle since 1913 because the escapement in 1917, whatever size it may have been, was severely impaired by the obstruction at Hell's Gate.

Field observations in the spring of 1958 on the Chilko and Horsefly Rivers indicated that egg to fry survival of the 1957 brood was normal for these two major spawning areas.

In 1959, a combination of either complete counts or a carefully calibrated index established the number of seaward migrants from three areas supporting 85 per cent of the 1957 spawning escapement. The Stuart Lake area produced an estimated 64,000,000 seaward migrants; Quesnel—32,000,000 and Chilko—10,000,000. On the basis of the data obtained from these three areas, it was estimated that 125,000,000 downstream migrants were produced from the 1957 brood spawning. The size and condition of the migrants was excellent in all areas observed.

In spite of the favorable production in fresh water the returning adult sockeye run in 1961, including the catch in non-Convention waters, was only 4,699,000 fish. Yet, on the basis of the number and condition of the seaward migrants in the spring of 1959 an excellent adult run should have returned in 1961. A marine survival rate similar to that which produced the 1958 Adams run would have returned 26,000,000 sockeye in 1961. Since the seaward migrants producing the 1961 run were larger than those which produced the 1958 run even higher marine survival rates were possible. If the more average marine conditions which produced the 1959 adult run had prevailed, a run of 20,000,000 adults would have returned in 1961. It is an obvious conclusion that the man-

agement of the fishery in 1957 was not in any way at fault. The cyclical escapement was the best since 1917, fry production was normal, the condition of the seaward migrants was excellent and the number of migrants was sufficient to return a sockeye run considerably larger than that of any year since 1913—ever larger than the record-breaking Adams River run in 1958.

The anomalies in the runs of Fraser River sockeye and pink salmon, apparently related to unusual fluctuations in marine environment, have occurred with alarming frequency during the past ten years. These anomalies were discussed in the 1959 Annual Report and have been individually referenced for several years. While similar anomalies occurred prior to 1950, it appears that they occurred with far less frequency although the data for prior years is meagre and confused by other factors such as the Hell's Gate obstruction.

The effect of variations in the environment of the *high seas* on salmon survival is not known, but all information available to date on several species of salmon suggests that the effect is moderate and the survival rate in this marine area is fairly consistent. The extreme fluctuations in the marine survival of salmon apparently occur during the estuarial transfer of the young salmon from their river of birth to their oceanic pastures, regardless of their age or size. Survival of Fraser River pink salmon fry has been inversely related, within practical limits of variation, to the mean temperature of Georgia Strait for the period of a few months following the entrance of these fry into this estuarial area. In the case of Fraser River sockeye, the approximate adult survival of the seaward migrants has been related for some nine years to the flow of the Fraser River at its mouth *at the time* the migrants enter Georgia Strait. Growth during the first few months of marine existence likewise has an apparent value in the prediction of adult survival. Both of the above relationships were used in forecasting a relatively poor run of four to seven million sockeye for 1961 in spite of the sizeable potential indicated by the number of downstream migrants.

The forecasting of salmon survival on the basis of past relationships incorporates a serious weakness as long as the functioning of the factors used is not thoroughly understood. Even though a relationship is established which has a high statistical significance, it can still be a fortuitous one or be subject to an occasional important influence from the intervention of another factor.

An example of possible error in predicting runs of Fraser River sockeye is evident in the 1961 season. While the general relationship of the survival of all seaward migrants to the flow of the Fraser River was established within practical limits, individual racial survival varied from rather high rates at the beginning of the season to extreme lows toward the end of the season. The average survival rate of all races conformed to the relationship but the survival rates of individual races did not always show a similar conformity.

The acquisition of biological knowledge is a slow and methodical process, so the obtaining of an understanding of the factors affecting survival of salmon during any period in the sea may possibly be a long term and difficult project. In the meantime it is apparent that the prediction of Fraser River sockeye and pink salmon runs on the basis of the number of adult spawners, fry hatched, or downstream migrants, or all three combined, can be subject to serious errors.

It is not yet possible to define all the factors affecting Fraser River sockeye and pink salmon survival or to understand the functioning of these factors. Neither can it be concluded that the factors apparently influencing survival of Fraser River stocks are operative in the same manner in other producing areas.

Nevertheless, variable estuarial factors have been closely related to marine survival of Fraser River sockeye and pink salmon during a period of several years when extreme fluctuations in the survival rates have occurred, so it is reasonable to assume that these relationships should continue to provide a means of forecasting runs within practical limits. However, each method of predicting survival will be viewed with some suspicion until the functioning of the factor used in formulating the method is fully understood. As long as the method, or methods, work they will be used. As long as fresh water production is satisfactory the isolation of the marine environment, principally that in the inshore area as an apparent cause of highly variable mortality, justifies the management principles used regardless of whether the returning run is large or small. A return to more stable meteorological conditions would certainly tend to stabilize the production of Fraser River sockeye and pink salmon.

COMMISSION MEETINGS

The International Pacific Salmon Fisheries Commission held eleven formal meetings during 1961; the approved minutes for these meetings being forwarded to the Governments of the United States and Canada. The first meeting of the year was held on January 19 and 20 with the meeting on January 20 including the Commission's Advisory Committee composed of the following members:

Canada	*United States*
H. Stavenes Purse Seine Crew Members	John Brown Reef Net Fishermen
Richard Nelson Salmon Processors	John Plancich Salmon Processors
M. W. Black Sport Fishermen	Howard Gray Sport Fishermen
Peter Jenewein Gill Net Fishermen	Joe Erisman Gill Net Fishermen
Charles Clarke Purse Seine Fishermen	N. Mladinich Purse Seine Fishermen
R. H. Stanton Troll Fishermen	Bert G. Johnston Troll Fishermen

The tentative recommendations for regulatory control of sockeye and pink salmon fishing in Convention waters for the year 1961, as submitted to the Advisory Committee on December 16, 1960, were discussed with the Committee and revisions were made as a result of the discussions. The recommendations for regulations governing the 1961 sockeye and pink salmon fishery in Convention waters were approved and were submitted for approval of the Government of Canada on February 8, 1961 and the Government of the United States on February 9, 1961. In a regular executive session the Commission approved a detailed study of sockeye production in the Birkenhead River with emphasis on the desirability of instituting an operation designed to increase the sockeye fishery supported by this river system.

On March 30, 1961 the Commission inspected potential sites for the Sweltzer Creek Field Station and, after convening for regular business, approved the estimates for the Commission budget covering the fiscal year 1962-1963. Technical problems related to the restricted migration of Early Stuart sockeye through the Fraser Canyon were considered and remedial action in removing one high water obstruction was authorized.

An executive meeting of the Commission was held on June 28, 1961 to expedite progress on several functional items and to consider current proposals for hydroelectric power development in the region. Mr. Clarence F. Pautzke attended the meeting as a new United States Commissioner replacing Mr. Arnie J. Suomela. Mr. George C. Starlund, newly appointed Director of Fisheries for the State of Washington attended as an official observer in place of Mr. Milo Moore.

A meeting of the Commission was necessary on July 31 to consider regulatory adjustments required to obtain adequate spawning escapement from the current runs of sockeye. Recommendations for adjustment of existing regulatory control in Convention waters and a supplemental budget estimate of $220,000 for the removal or overcoming of high water obstructions to sockeye migration in the Fraser Canyon were authorized.

A fifth meeting of the Commission was held on August 8, 1961 to execute the regulatory changes required for obtaining adequate escapement of sockeye to the Quesnel and Stuart Lake spawning areas.

The Commission met with its Advisory Committee on August 18 to discuss the development of regulatory problems during the current fishing season and the need for adjustment in existing regulations to protect the small run of Fraser River pink salmon. Suggestions for changes in the existing regulations were discussed and the required recommendations for modification were adopted. Mr. J. C. Murray attended his first meeting as representative of the Canadian Sport Fishermen replacing Mr. M. W. Black.

On August 25, 1961 the Commission reviewed the status of the Fraser River pink salmon run and approved a recommendation closing commercial fishing in all Convention waters, except the Fraser River, for a period of one week to obtain the required increase in the spawning escapement.

An emergency meeting of the Commission was held on September 1, 1961 to review conditions for obtaining an escapement of pink salmon and recommendations for additional closures of the commercial fishery were approved.

The ninth meeting of the Commission was held with its Advisory Committee on September 14, 1961 to review the 1961 sockeye fishery and consider the possible need for additional restrictions on the pink salmon fishery in Convention waters.

The Commission met in executive session on November 27, 1961 to review the results of the fishery management program in Convention waters for 1961 and to examine in detail the advice of the Director to the effect that the 1962 run of Fraser River sockeye would be far below normal expectations. Mr. George Starlund attended the meeting for the first time as an officially appointed United States Commissioner replacing Mr. Milo Moore.

The eleventh and final meeting of the year consisted of informal discussion on the afternoon of December 17, 1961, an executive business session on December 18 and an open meeting with the Advisory Committee on December 19. The purpose of the open meeting was to provide the Advisory Committee and the several hundred interested people in attendance with a review of the 1961 fishing season, details on adverse factors apparently controlling the size of the 1962 Fraser River sockeye run and the regulatory requirements tentatively considered necessary for the proper management of the fishery.

1961 REGULATIONS

Recommendations for regulations governing the 1961 sockeye and pink salmon fishery in Canadian Convention waters were adopted at a meeting of the Commission held on January 20, 1961 and submitted for approval and implementation to the Government of Canada on February 8, 1961. Recommendations for regulations governing the 1961 sockeye and pink salmon fishery in United States Convention waters were adopted at a meeting of the Commission held on January 20, 1961 and submitted to the Government of the United States for approval and to the State of Washington for activation on February 9, 1961. The recommendations for Canadian Convention waters were implemented by the Government of Canada in an Order-in-Council dated March 30, 1961 and for United States Convention waters by an order of the Director of the Washington State Department of Fisheries on April 28, 1961.

The recommendations of the Commission were as follows:

Canadian Convention Waters

"The International Pacific Salmon Fisheries Commission appointed pursuant to the Convention between Canada and the United States of America for the protection, preservation and extension of the Sockeye Salmon Fisheries in the Fraser River System, signed at Washington on the 26th day of May, 1930, as amended by the Pink Salmon Protocol signed at Ottawa on the 28th day of December, 1956, hereby recommends that regulations to the following effect, in the interests of such fisheries, be adopted by Order-in-Council as amendments to the Special Fishery Regulations for British Columbia, for the season of 1961 under the authority of the Fisheries Act, namely:

1. (1) No person shall fish for sockeye or pink salmon in the waters of the southerly portion of District No. 3 embraced in Area 20 and that portion of Area 19 lying westerly of a straight line drawn across Juan de Fuca Strait joining William Head and Angeles Point through Race Rocks commencing at point of intersection with the international boundary line with purse seines:

(a) From the 24th day of June, 1961, to six o'clock in the forenoon of the 17th day of July, 1961, both dates inclusive;

(b) From the 17th day of July, 1961, to the 19th day of August, 1961, both dates inclusive, except from six o'clock in the forenoon to six o'clock in the afternoon of Monday and Tuesday in each week;

(c) From the 20th day of August, 1961, to the 2nd day of September, 1961, both dates inclusive, except from six o'clock in the forenoon to six o'clock in the afternoon of Monday in each week; and

(d) From the 3rd day of September, 1961, to six o'clock (P.S.T.) in the afternoon of the 24th day of September, 1961, both dates inclusive, except from six o'clock in the forenoon to six o'clock in the afternoon of Monday and Tuesday in each week.

(2) No person shall fish for sockeye or pink salmon in the waters described in subsection (1) of this section with gill nets:

(a) From the 24th day of June, 1961, to six o'clock in the afternoon of the 17th day of July, 1961, both dates inclusive;

(b) From the 17th day of July, 1961, to the 19th day of August, 1961, both dates inclusive, except from

(i) six o'clock in the afternoon of Monday to six o'clock in the forenoon of Tuesday; and

(ii) six o'clock in the afternoon of Tuesday to six o'clock in the forenoon of Wednesday in each week;

(c) From the 20th day of August, 1961, to the 2nd day of September, 1961, both dates inclusive, except from six o'clock in the afternoon of Monday to six o'clock in the forenoon of Tuesday of each week; and

(d) From the 3rd day of September, 1961, to six o'clock (P.S.T.) in the afternoon of the 24th day of September, 1961, both dates inclusive, except from

(i) six o'clock in the afternoon of Monday to six o'clock in the forenoon of Tuesday; and

(ii) six o'clock in the afternoon of Tuesday to six o'clock in the forenoon of Wednesday in each week.

(3) No person shall fish for sockeye or pink salmon in the waters described in subsection (1) of this section with commercial trolling gear from the 16th day of July, 1961, to six o'clock (P.S.T.) in the afternoon of the 24th day of September, 1961, both dates inclusive, except from one minute after twelve o'clock in the forenoon of Monday to one minute after twelve o'clock in the forenoon of the following Saturday in each week.

2. No person shall fish for sockeye or pink salmon in the waters of the said southern portion of District No. 3 embraced in Areas 17 and 18 and that portion of Area 19 lying easterly of a straight line drawn across Juan de Fuca Strait joining William Head and Angeles Point through Race Rocks commencing at point of intersection of the international boundary line and in the waters of District No. 1 by means of nets from the 25th day of June, 1961, to the 2nd day of September, 1961, both dates inclusive except from eight o'clock in the forenoon of Monday to eight o'clock in the forenoon of Wednesday in each week.

3. No person shall fish for sockeye or pink salmon in the waters of the said southern portion of District No. 3 embraced in Areas 17 and 18 and that portion of Area 19 lying easterly of a straight line drawn across Juan de Fuca Strait joining William Head and Angeles Point through Race Rocks commencing at point of intersection of the international boundary line by means of nets from the 3rd day of September, 1961, to the 8th day of October, 1961, both dates inclusive.

4. No person shall fish for sockeye or pink salmon in the waters of District No. 1:

(a) by means of nets from the 3rd day of September, 1961, to the 9th day of September, 1961, both dates inclusive;

(b) by means of nets from the 10th day of September, 1961, to the 16th day of September, 1961, both dates inclusive except from eight o'clock in the forenoon of Monday to eight o'clock in the forenoon of Tuesday;

(c) by means of nets from the 17th day of September, 1961, to the 23rd day of September, 1961, both dates inclusive, except from eight o'clock in the forenoon of Tuesday to eight o'clock in the forenoon of Wednesday; and

(d) by means of nets from the 24th day of September, 1961, to the 8th day of October, 1961, both dates inclusive except from eight o'clock (P.S.T.) in the forenoon of Monday to eight o'clock (P.S.T.) in the forenoon of Tuesday of each week.

5. Section 4 above does not apply to sockeye or pink salmon taken in gill nets having mesh of not less than 9 inches extension measure for linen nets and 9½ inches extension measure for nylon nets from the 3rd day of September, 1961, to the 30th day of September, 1961, both dates inclusive, where operation of gill nets having a mesh greater in size than the minimum measurement prescribed herein has been authorized for the taking of spring salmon by the Area Director of Fisheries for British Columbia pursuant to the provisions of the British Columbia Fishery Regulations.

All times hereinbefore mentioned shall be Pacific Daylight Saving Time except where otherwise specified."

United States Convention Waters

"The International Pacific Salmon Fisheries Commission appointed pursuant to the Convention between Canada and the United States of America for the protection, preservation and extension of the Sockeye Salmon Fisheries in the Fraser River System, signed at Washington on the 26th day of May, 1930, as amended by the Pink Salmon Protocol signed at Ottawa on the 28th day of December, 1956, hereby recommends to the Director of Fisheries of the State of Washington, that regulations to the following effect in the interests of such fisheries, be adopted by him for the year 1961 by virtue of authority in him vested by Section 6 of Chapter 112 of the Laws of the State of Washington of 1949, namely:

1. (1) No person shall fish for sockeye or pink salmon in the Convention waters of the United States lying easterly of a straight line drawn from the lighthouse on Tatoosh Island in the State of Washington to Bonilla Point in the Province of British Columbia and westerly of a straight line drawn from Angeles Point in the State of Washington across Race Rocks to William Head in the Province of British Columbia with purse seines:

(a) From the 24th day of June, 1961, to four o'clock in the forenoon of the 17th day of July, 1961, both dates inclusive;

(b) From the 17th day of July, 1961, to the 12th day of August, 1961, both dates inclusive, except from four o'clock in the forenoon to eight o'clock in the afternoon of Monday, Tuesday and Wednesday of each week;

(c) From the 13th day of August, 1961, to the 2nd day of September, 1961, both dates inclusive, except from four o'clock in the forenoon to eight o'clock in the afternoon of Monday and Tuesday of each week; and

(d) From the 3rd day of September, 1961, to six o'clock in the afternoon of the 24th day of September, 1961, both dates inclusive, except from four o'clock in the forenoon to eight o'clock in the afternoon of Monday, Tuesday and Wednesday of each week.

(2) No person shall fish for sockeye or pink salmon in the waters described in subsection (1) of this section with gill nets:

(a) From the 24th day of June, 1961, to six o'cock in the afternoon of the 16th day of July, 1961, both dates inclusive;

(b) From the 16th day of July, 1961, to the 5th day of August, 1961, both dates inclusive, except from

(i) six o'clock in the afternoon of Sunday to eight o'clock in the forenoon of Monday;

(ii) six o'clock in the afternoon of Monday to eight o'clock in the forenoon of Tuesday; and

(iii) six o'clock in the afternoon of Tuesday to eight o'clock in the forenoon of Wednesday of each week.

(c) From the 6th day of August, 1961, to the 12th day of August, 1961, both dates inclusive, except from

(i) six o'clock in the afternoon of Monday to eight o'clock in the forenoon of Tuesday;

(ii) six o'clock in the afternoon of Tuesday to eight o'clock in the forenoon of Wednesday; and

(iii) six o'clock in the afternoon of Wednesday to eight o'clock in the forenoon of Thursday.

(d) From the 13th day of August, 1961, to the 2nd day of September, 1961, both dates inclusive, except from

(i) six o'clock in the afternoon of Monday to eight o'clock in the forenoon of Tuesday; and

(ii) six o'clock in the afternoon of Tuesday to eight o'clock in the forenoon of Wednesday of each week.

(e) From the 3rd day of September, 1961, to six o'clock in the afternoon of the 24th day of September, 1961, both dates inclusive, except from

(i) six o'clock in the afternoon of Monday to eight o'clock in the forenoon of Tuesday;

(ii) six o'clock in the afternoon of Tuesday to eight o'clock in the forenoon of Wednesday; and

(iii) six o'clock in the afternoon of Wednesday to eight o'clock in the forenoon of Thursday of each week.

(3) No person shall fish for sockeye or pink salmon in the waters described in subsection (1) of this section with commercial trolling gear from the 16th day of July, 1961, to the 24th day of September, 1961, both dates inclusive, except from midnight Sunday to midnight Friday of each week.

2. (1) No person shall fish for sockeye or pink salmon in the Convention waters of the Unied States of America lying easterly of a straight line drawn from Angeles Point in the State of Washington across Race Rocks to William Head in the Province of British Columbia with purse seines or reef nets:

(a) From the 24th day of June, 1961, to the 12th day of August, 1961, both dates inclusive, except from four o'clock in the forenoon to eight o'clock in the afternoon of Monday, Tuesday and Wednesday of each week; and

(b) From the 13th day of August, 1961, to the 2nd day of September, 1961, both dates inclusive, except from four o'clock in the forenoon to eight o'clock in the afternoon of Monday and Tuesday of each week;

(c) From the 3rd day of September, 1961, to six o'clock in the afternoon of the 1st day of October, 1961, both dates inclusive except from four o'clock in the forenoon to eight o'clock in the afternoon of Monday, Tuesday and Wednesday of each week.

(2) No person shall fish for sockeye or pink salmon in the waters described in subsection (1) of this section with gill nets:

(a) From the 24th day of June, 1961, to the 5th day of August, 1961, both dates inclusive, except from

(i) six o'clock in the afternoon of Sunday to eight o'clock in the forenoon of Monday;

(ii) six o'clock in the afternoon of Monday to eight o'clock in the forenoon of Tuesday; and

(iii) six o'clock in the afternoon of Tuesday to eight o'clock in the forenoon of Wednesday of each week.

(b) From the 6th day of August, 1961, to the 12th day of August, 1961, both dates inclusive, except from

(i) six o'clock in the afternoon of Monday to eight o'clock in the forenoon of Tuesday;

(ii) six o'clock in the afternoon of Tuesday to eight o'clock in the forenoon of Wednesday; and

(iii) six o'clock in the afternoon of Wednesday to eight o'clock in the forenoon of Thursday.

(c) From the 13th day of August, 1961, to the 2nd day of September, 1961, both dates inclusive, except from

(i) six o'clock in the afternoon of Monday to eight o'clock in the forenoon of Tuesday; and

(ii) six o'clock in the afternoon of Tuesday to eight o'clock in the forenoon of Wednesday in each week.

(d) From the 3rd day of September, 1961, to six o'clock in the afternoon of the 1st day of October, 1961, both dates inclusive, except from

(i) six o'clock in the afternoon of Monday to eight o'clock in the forenoon of Tuesday;

(ii) six o'clock in the afternoon of Tuesday to eight o'clock in the forenoon of Wednesday; and

(iii) six o'clock in the afternoon of Wednesday to eight o'clock in the forenoon of Thursday of each week.

3. No person shall fish for sockeye or pink salmon in the Convention waters of the United States of America lying westerly of a straight line drawn true south from the southeast tip of Point Roberts in the State of Washington (otherwise known as Lilly Point) to the international boundary line from the 3rd day of September, 1961, to the 9th day of September, 1961, both dates inclusive.

4. No person shall fish for sockeye or pink salmon in the Convention waters of the United States of America lying westerly of a straight line drawn from the Iwersen Dock on Point Roberts in the State of Washington to the flashing white light on Georgina Point at the entrance to Active Pass in the Province of British Columbia from the 10th day of September, 1961, to the 24th day of September, 1961, both dates inclusive.

All times hereinbefore mentioned shall be Pacific Standard Time.

In making the above recommendations for regulatory control of sockeye and/or pink salmon fishing in the Convention waters of the United States of America for the year 1961 the Commission recognizes the need for the continued maintenance of certain preserves previously established by the Director of Fisheries of the State of Washington for the protection and preservation of other species of food fish."

Emergency Amendments

In order to provide for adequate racial escapement of Fraser River sockeye and pink salmon and for an equal share of the season's catch of each of the two species by the fishermen of Canada and the United States the approved regulations as detailed above were later amended on recommendation of the International Pacific Salmon Fisheries Commission. A detailed list of the regulatory amendments is as follows:

July 6, 1961—In the interest of equalizing the catch of sockeye between the fishermen of the two countries fishing time was reduced by 24 hours for the week commencing July 9 in United States Convention waters lying easterly of the Angeles Point-William Head Line.

July 10, 1961—In the interest of equalizing the catch of sockeye between the fishermen of the two countries fishing time was increased by 24 hours effective Wednesday, July 12 in Canadian Convention waters lying easterly of the Angeles Point-William Head Line.

July 12, 1961—In the interest of equalizing the catch of sockeye between the fishermen of the two countries fishing time was increased an additional 24 hours effective July 13 for Canadian Convention waters lying easterly of the Angeles Point-William Head Line.

July 24, 1961—Action was taken to further equalize the sockeye catch between the fishermen of the two countries by adding an additional 24 hours of fishing time effective Wednesday, July 26 in Canadian Convention waters of Juan de Fuca Strait lying westerly of the Angeles Point-William Head Line.

August 1, 1961—To provide for increased escapements of sockeye destined for the Quesnel and Stuart River systems action was taken to reduce fishing time to 24 hours on August 10 for the week commencing August 6 in all United States Convention waters, to close all Canadian Convention waters lying easterly of the Angeles Point-William Head line commencing August 2 until August 10, and to close Canadian Convention waters in Juan de Fuca Strait lying westerly of the Angeles Point-William Head line commencing August 2 until August 9.

August 8, 1961—To further provide for increased escapement of sockeye and allow for equalization of the sockeye catch the Canadian Convention waters of Juan de Fuca Strait lying westerly of the Angeles Point-William Head line were closed at six o'clock a.m. Tuesday, August 11 after a 48-hour fishing period until six o'clock a.m. Tuesday, August 15 at which time 48 hours of fishing time was permitted; all Canadian Convention waters lying easterly of the Angeles Point-William Head line were further closed until eight o'clock a.m. Sunday, August 13 after which time three days fishing was permitted; the opening time for fishing in United States Convention waters for the week commencing August 13 was delayed until August 15.

August 18, 1961—In the interest of equalizing the catch of pink salmon between the fishermen of the two countries fishing time was increased by 24 hours for the week commencing August 20 in the Canadian Convention waters of Juan de Fuca Strait lying westerly of the Angeles Point-William Head line.

August 25, 1961—In the interest of the conservation of pink salmon all United States Convention waters and all Canadian Convention waters were closed for the week commencing August 27 except those waters of the Fraser River lying above a line extending from Point Grey Buoy to North Arm Jetty to Sand Heads Light to Canoe Pass Buoy to the Light on the westerly end of Tsawwassen Causeway and thence towards West Point Roberts Light to the international boundary line; this latter area being open for a period of 48 hours commencing at eight o'clock a.m. August 28.

September 1, 1961—In the interest of the conservation of sockeye and pink salmon and coinciding with an equivalent net fishing restriction the waters of District No. 1 of Canadian Convention waters were closed to commercial trolling from eight o'clock a.m. Monday, September 4 to eight o'clock a.m. Monday, September 25. To provide further protection for the light run of Fraser River pink salmon all United States Convention waters were closed until September 18; Canadian Convention waters in Juan de Fuca Strait westerly of the Angeles Point-William Head line were closed until September 5 at which time fishing was permitted for 48 hours, thence these waters were closed until September 17, the Commission relinquishing regulatory control after that date; waters of

District No. 1 were closed until September 25 except that fishing for spring salmon with large mesh nets was permitted by the Canada Department of Fisheries for 12 hours daily in the Fraser River proper on September 7, 13 and 21.

September 8, 1961—The closure previously established in Canadian Convention waters of Juan de Fuca Strait lying westerly of the Angeles Point-William Head line was modified to permit 48 hours of fishing effective September 12 and 13 to assist in determining the strength of the late run of Fraser River pink salmon.

September 17, 1961—In view of the absence of pink salmon in United States Convention waters regulatory controls were relinquished except in those waters lying northerly of a line projected from Point Whitehorn to Patos Island Light thence true west to the international boundary, the latter waters being closed until September 25.

September 21, 1961—The closure of the Canadian Convention waters of District No. 1 to all fishing including commercial trolling was extended to October 2 for the protection of pink and sockeye salmon.

September 24, 1961—United States Convention waters lying northerly of a line projected in a southwesterly direction from the Iwersen Dock on Point Roberts to the light on Georgina Point at the entrance to Active Pass were closed from September 25 until October 2 for the protection of the Fraser River pink salmon run.

September 25, 1961—Fishing for spring salmon with large mesh nets was permitted for 12 hours on September 27 in the Fraser River by the Canada Department of Fisheries.

September 28, 1961—To further protect the light Fraser River pink salmon run the closure of the waters of District No. 1 of Canadian Convention waters was extended to October 3 at which time fishing was permitted for a 24-hour period prior to the relinquishment of control by the Commission on October 8. Regulatory controls were relinquished in all Canadian Convention waters lying easterly of the Angeles Point-William Head line except the waters of District No. 1 effective October 1.

SOCKEYE SALMON REPORT

The Fishery

The timing of sockeye entering the fishery was slightly later than that of 1953 but considerably earlier than in 1957, thus following the eight-year cycle frequency of alternating early and late runs. The average weight of 1961 sockeye was above that of the brood year for four-year-old fish and the relatively large size obviously contributed to an increase in the efficiency of the gill net fishery particularly in the United States.

Cyclical Average Weights of Four-Year-Old Fraser River Sockeye

Cycle Year	*Average Weight Pounds*	*Cycle Year*	*Average Weight Pounds*	*Cycle Year*	*Average Weight Pounds*
1917	5.47	1933	5.43	1949	5.85
1921	5.89	1937	5.06	1953	6.08
1925	5.76	1941	5.53	1957	5.27
1929	5.92	1945	5.71	1961	5.69

The share of the Canadian catch taken in Juan de Fuca Strait dropped slightly from that of the brood year because of the relative strength of the Early Stuart run which was fished in the Fraser River but passed through the Strait area prior to the opening date of the fishery on July 17. The unexplained drop in the marine survival rate of the later runs did not permit the Canadian Strait fishery to entirely compensate for the good catches made in the Fraser River fishery earlier in the season. The share of the Straits catch taken by gill nets increased substantially over that of the brood year as shown in the following table.

	Per cent of Canadian Sockeye Catch Taken in Juan de Fuca Strait	*Per cent of Canadian Sockeye Catch Taken by Purse Seines in Juan de Fuca Strait**		*Per cent of Canadian Sockeye Catch Taken by Gill Nets in Juan de Fuca Strait**	
Cycle Year	*Per Cent*	*Maximum P.S. Units*	*Per Cent*	*Maximum G.N. Units*	*Per Cent*
1961	46.73	101	26.00	395	20.23
1957	50.92	104	38.39	269	12.41
1953	33.01	66	29.81	12	1.92
1949	14.72	40	9.71	0	0.00
1945	3.14	0	0.00	0	0.00

* Troll catches not listed.

Due to the unexplained decline in marine survival rates of the individual runs as the season progressed, the abundance of the late season sockeye runs was lower than expected and this, plus the high efficiency of the fishing gear, caused serious regulatory difficulties, particularly in United States Convention waters. Having regard for the number of fish available, record catches were made in United States waters and proper management of the fishery was possible only by frequent adjustment of fishing time. Under the prevailing circumstances it is fortunate that practical division of the catch between the two countries was obtained and the catch-escapement ratio apparently was satisfactory.

The total catch of 2,735,491 sockeye was less than that of the two preceding cycle years (Table II) but, due to the relatively large size of the fish, the number of cases packed was larger than that of the brood year. The 1961 pack of sockeye was the third largest for the cycle since 1917. The share of the catch by each country was as follows: Canada 49.61 per cent and the United States 50.39 per cent.

The effect of increasing units of gear, greater gear efficiency, and expanded fishing area in Convention waters has been largely offset by reduced fishing time to a point where management of the fishery has become extremely difficult and liable to possible errors of importance. Coinciding with the reduction in fishing time there has been increasing dissatisfaction on the part of the fishermen. Even in 1959 when the sockeye catch exceeded any for the cycle year for 56 years and in 1960 when the catch was the second best for that cycle year in 48 years the fishermen were unhappy with their individual returns.

The Commission by its terms of reference cannot concern itself directly with the economic plight of the individual fishermen, but it is becoming increasingly obvious that the regulations necessary for good management are not only difficult for the Commission to design but they are militating against a healthy and happy industry in spite of relatively good total catches. The income of many individual fishermen is declining in relation to the total catch of Fraser River sockeye because of the increase in the total units of gear and wider fishing effort. This developing situation in its various aspects and the limitations of the Commission under the terms of the Convention in relation to it has been drawn pointedly to the attention of the industry and the two Governments. In the opinion of the Commission it is of vital importance to the prosperity of the industry and to the conservation of the Fraser River salmon resources that the intensity of fishing pressure be brought to a rational standard.

Escapement

The net sockeye escapement recorded on the spawning grounds of the Fraser River watershed was 1,253,012 fish (Table VI) or 30.4 per cent of the total run in Convention waters, estimated at 4,126,031 sockeye. When the estimated catch of Fraser River sockeye in non-Convention waters is included the net escapement is lowered to 26.70 per cent of a total run of 4,698,881 fish.

The spawning escapement for 1961 was down substantially over that of the brood year (1957) but much of the decline was in relatively non-productive jacks or three-year-olds. The 1961 escapement of four-year-old or older sockeye was 1,163,000 fish compared with 1,341,000 in 1957 and 1,035,000 in the previous brood year of 1953. Individual escapement requirements were exceedingly difficult to obtain because of the decline in the marine survival of the racial populations as the season progressed. Extensive closures of the fishery were required during August to obtain reasonably satisfactory escapements to many of the reproductive areas. Late runs, with the exception of the one to the Harrison River, were very poor. The almost complete closure of the pink salmon fishery when the late running sockeye were available prevented a substantial decline in the cyclical escapement of these populations.

The escapements of the early season runs destined for the Early Stuart spawning areas, Upper Pitt River and Bowron River were down slightly over those of the brood year. Excellent flow conditions prevailed in the Fraser Canyon during the upstream migration of sockeye destined for the Early Stuart spawning areas and the fish arrived on time and in excellent condition. Many of the smaller spawning tributaries of Takla Lake and Middle River had a very low flow due to the record-breaking warm summer season, and sockeye found it difficult, if not impossible at times, to enter these streams. The low flow of some of the streams is believed responsible for the heavy spawning in the Driftwood River, Frypan and Narrows Creeks on Upper Takla Lake where flow conditions were nearer normal.

Escapements to Gates and Scotch Creeks were a disappointment and the rehabilitation of these areas is obviously set back by the exceptionally poor marine survival of this year class. All other summer runs had a fairly satisfactory escapement with the exception of the run to Chilko Lake. Approximately 10,000,000 migrants went to sea in 1959 from the spawning of 140,765 fish in this latter area in 1957. In 1961, only 40,315 Chilko fish returned to the spawning ground from a moderate fishery indicating that the marine survival of the Chilko seaward migrants was alarmingly low, being approximately 1.0 per cent. The decline in the production of Chilko fish in 1961, while economically serious, is not believed to be serious in terms of total quadrennial production. The 1961 cycle represents one of the two off-years of production for the Chilko area, hence a small run to this area would approach what is believed to be a normal situation.

The Late Stuart and Quesnel spawning areas, both major producers on the 1961 cycle, had satisfactory escapements. The escapement of 411,000 sockeye to the Late Stuart spawning areas was down from the brood year figure of 527,000 but is still a substantial number compared with only 5,400 in 1941, five cycle years earlier. The Quesnel escapement reached a record of 302,000 sockeye compared with 229,000 in the brood year and only 1,100 in the 1941 cycle year.

Sockeye, principally three-year-old jacks, were observed in several locations in the Lower Fraser River area during December and January (1962). On December 13, 1961, twenty-six jacks and four adults were observed in Gallagher Creek, tributary to Sullivan Slough near Agassiz, B.C. An examination of sixteen scale samples indicated that the fish may have been of Adams River origin although no sockeye were observed above Hell's Gate during the period in question. On December 21, 1961, an observer of the Canada Department of Fisheries reported the presence of twenty to thirty jacks and three adult sockeye in Maria Slough. Significant numbers of jack sockeye obviously were present in the Hope-Yale area since an Indian reported taking fifteen to twenty jacks per week during December and a few were taken up to January 7, 1962. Another Indian reported catching twenty to fifty jack sockeye for an overnight set during December near Hope, B.C. The occurrence of a significant run of jack sockeye in the Lower Fraser Fiver during December and early January has no recorded precedent and cannot be explained on the basis of the information available.

While the 1961 escapement was generally satisfactory in numbers, temperature conditions were decidedly adverse during the upstream migration of the late July and August runs and similar adverse temperatures existed on many of the spawning grounds. It was reported that average air temperatures in several interior areas reached an all time record high. To illustrate the high water temperatures prevailing in the main Fraser River during July and August the following table is presented:

Average Fraser River Water Temperatures at New Westminster

Years	*July*	*August*	*September*
1927-1939	60.9	63.0	59.4
1940-1949	61.6	63.5	60.2
1950-1961	60.7	63.3	59.4
1961	63.9	67.4	58.8

Maximum water temperatures at times exceeded 72°F in the Lower Horsefly River during the upstream migration of the run to that river system. The existence of adverse river temperatures was recognized during the fishery on the Horsefly run and extra fishing time was granted on July 26 in Canadian Convention waters to reduce the early escapement. Extra closures of the fishery were provided during the latter part of the run which would migrate upstream and arrive on the spawning grounds during the period when lower water temperatures would be expected. The specially designed closures of the fishery during the latter part of the Horsefly run prevented almost 100 per cent mortality of the escapement. All of the first half of the escapement died without spawning and it was only the majority of the later arriving fish that were able to spawn successfully.

The effect of adverse water temperatures on several of the racial escapements is illustrated below:

Race	*Percentage of Female Sockeye Died Without Spawning*	*Race*	*Percentage of Female Sockeye Died Without Spawning*
Pitt River	5.0	Horsefly River	62.0
Bowron River	60.0	Late Stuart Area	18.0
Nadina River—		Stellako River	31.0
Early Run	86.0	Raft River	25.0
Late Run	5.0	Birkenhead River	35.0
Chilko River	31.0	Harrison River	2.0

The actual cause of the mortality of the spawning ground escapements was a bacterial infection of the gills, apparently stimulated by the above-average water temperatures. The gills of the sockeye became eroded and covered with fungus resulting in a lethargic condition of the fish preceding death. In many cases the fish actually matured and were ready to spawn but did not have sufficient energy to do so.

A more detailed understanding of the pathology of the disease and the factors related to its occurrence as a "hot strain" is essential to avoiding future losses if possible by regulation of the fishery. Cultures of the existing organisms on the gills of the dying fish have been obtained for future laboratory research at the new Sweltzer Creek field station. Temperature changes are always inherent in any flood control or hydroelectric project so that a full understanding of the tolerance limits of Fraser sockeye to temperature changes during migration and spawning is obviously necessary for the protection of the species.

In summary, it may be stated that the number of eggs actually deposited in the spawning grounds was 11.0 per cent greater than in 1953 but only 63.5 per cent of those deposited in 1957. The loss of unspawned fish, while serious, was not necessarily sufficient to retard rehabilitation by more than one cycle year. If a more favorable rate of marine survival prevails during the marine existence of the 1965 run than the low survival rate controlling the size of the 1957 and 1961 runs, an increase could occur in the number of sockeye returning in 1965.

Rehabiltation

The failure of the Pitt and Birkenhead sockeye runs to maintain themselves under existing fishing regulations, designed to permit the maximum allowable catch of other more important races migrating at the same time, has caused the Commission to place both of these river systems under experimental observation. Frequent staff observations revealed that the spawning grounds of Pitt River were extremely unstable. A decision was made to install an experimental hatchery for increasing fry production and thereby increasing the adult sockeye run to a size capable of withstanding the same fishing rate allowable on more productive upriver races migrating through the fishery at the same time.

The experimental hatchery located on Corbold or Seven Mile Creek, a natural sockeye spawning tributary of the main Pitt River, was completed in time for operation on the 1960 run. Certain faults known to exist in hatchery operations were eliminated in the design of the hatchery. On the basis of experiments conducted in earlier years at the Quesnel Field Station, light was eliminated during incubation and the young fry were allowed to release themselves from the hatchery. The usual initial operating difficulties of any hatchery occurred during 1960 with the result that the loss of eggs and fry totalled 23.0 per cent instead of the usual figure of less than 10.0 per cent.

In spite of the high hatchery mortality 2,508,000 fry were obtained from 3,257,000 eggs spawned artificially from 1,235 females for a survival rate of eggs to fry of 77.0 per cent. A calculated total of 11,664 female sockeye spawned naturally in the river system depositing an estimated 46,656,000 eggs. A fry enumeration program on the river in the spring of 1961 revealed that an estimated 2,071,000 fry resulted from natural spawning or an egg to fry survival rate of only 4.44 per cent. The relatively small number of eggs artificially spawned and incubated in the hatchery produced more fry than the natural spawning in the river.

The survival to the fry stage of only 4.44 per cent of the naturally deposited eggs substantiates the Commission's previous observations that the Pitt River spawning grounds are very unstable and the conclusion that the decline in the Pitt sockeye run is probably due to this fact. A greater release of fry from the hatchery than from natural spawning areas does not by itself prove that artificial propagation is the answer to the problem. Artificially propagated salmon fry are notably different from those produced naturally and the history of hatchery operation has amply demonstrated that hatchery fry do not survive at the same rate as those produced naturally. While the modifications in the usual hatchery methods, as incorporated in the Pitt River operation, are known to improve the condition of hatchery fry, extensive experiments are planned at the Sweltzer Creek field station—not only to detect any remaining difference in the condition of the two types of fry—but to determine the cause and a method for its elimination if such a difference is found to exist.

A total of 4,060,000 eggs were spawned from 1,218 female sockeye and placed in the hatchery during the period from September 5 to September 18, 1961. Natural fry hatch in the river system, resulting from the spawning of an estimated total of 5,400 females will be enumerated and compared with hatchery releases as was done in 1960. Sampling of natural fry for comparative studies with hatchery fry will be undertaken throughout the period of emergence.

A fry enumeration program was carried out in the Birkenhead River during the spring of 1961 to determine the success of natural spawning in this area which, like Pitt River, has a declining sockeye run. Surprisingly the fry hatch was 24.3 per cent of the estimated eggs deposited naturally in the river system as compared with only 4.4 per cent for Pitt River. On the basis of one year's data it would appear that the spawning grounds of Birkenhead River are quite efficient and that poor fry production may not be the cause of the decline in the Birkenhead run of sockeye. Observation of the success of incubation on the Birkenhead River will be continued for another three years, augmented by a more detailed observation of the Indian Fishery on this race of sockeye.

A transplant of 520,000 eyed eggs from Seymour River to the Upper Adams River in 1957 apparently failed to return any adult sockeye to the receiving area. Several examinations of Upper Adams River were made during late August and September and under favorable visibility conditions, but no sockeye were observed.

A return of 335 adult sockeye was observed in Barriere River. Although 38 sockeye spawned naturally in the Barriere in the brood year there was an added transplant of 550,000 eyed eggs from the Raft River which is believed responsible for the substantial increase in the 1961 run. Sockeye were also observed spawning at several places in the North Thompson River for the second consecutive year, indicating the possibility that some of the survivors from the transplanted eggs may be straying from the planted stream.

An experiment designed to start a sockeye run into Tezzeron Lake of the Stuart River System was almost a failure due to operational difficulties. A total of 1,370,000 eggs were spawned and incubated in Gluske Creek, tributary of Takla Lake, in August, 1961 but a flash flood caused a heavy mortality of eggs with the result that only 534,000 eggs reached the eyed stage for planting in Hatdudatehl Creek tributary to Tezzeron Lake. An attempt will be made in the spring of 1963 to determine if any downstream migrants leave Tezzeron Lake but the isolated nature of the area may make such observations difficult.

PINK SALMON REPORT

The runs of Fraser River pink salmon were maintained at a relatively high level of abundance from 1947 through 1955, primarily because of excellent conditions for survival during their marine existence. Mean water temperatures in Georgia Strait were relatively low during the summer residence of the young fish and studies by the Commission have established an inverse relationship between these water temperatures and ultimate marine survival of Fraser River pink salmon. During the period of high sea survival an effective Canadian fishery was developed in Juan de Fuca Strait and there was a substantial increase in the efficiency of all gear in all fishing areas. Nylon gill nets, seine power blocks, seine power skiffs, and drum seines became operative during the above period.

When the Pink Salmon Protocol was ratified on July 3, 1957, responsibility for managing the pink salmon fishery was transferred immediately to the International Pacific Salmon Fisheries Commission. Preliminary studies by the Commission indicated that the 1957 run would be significantly less in size than the runs returning in the previous five cycle years. Water temperatures in Georgia Strait were higher during the period of residence of the young fish

destined to return in 1957 and during the incubation period the tributary spawning streams had been subjected to a severe flood. Reductions were made in fishing time and a substantial escapement of 2,425,000 fish was obtained. The 1957 escapement enjoyed excellent spawning and incubation conditions resulting in what was believed to be an unusually successful emergence of young fry.

In 1958 when the seaward migrating fry from the 1957 escapement entered Georgia Strait, they encountered record high water temperatures, the average for the summer period being 61.8°F, or about five degrees above the temperatures encountered by the young fish which produced the runs from 1947 to 1955. A small run returned in 1959 although it was larger than anticipated on the basis of the high water temperatures prevailing in Georgia Strait in 1958. Presumably the 1959 run was larger than expected because of the exceptional number of fry produced from the spawning in the brood year.

For some reason, yet to be understood, the fishing gear was unusually effective in 1959 in all fishing areas except the Fraser River area. As an example, unit efficiency increased 71 per cent for gill nets in Juan de Fuca Strait and a similar amount for purse seines in the San Juan Islands. Severe overfishing occurred, since fishing restrictions designed to obtain a favorable catch-escapement ratio were based on the catch per unit of effort which in this case provided a false impression as to the size of the run. The escapement for the early segment of the run declined 46 per cent over that of the brood year and the escapement of the late segment declined 75 per cent. These small escapements occurred in spite of the fact that fishing time was reduced substantially from that prevailing in any previous cycle year.

Spawning conditions for the early segment run were most unfavorable in 1959 because of the record high water flows in the Thompson and Fraser Rivers at the time of spawning. High water velocities forced fish to spawn in the shallow shoreline areas which were later exposed by receding waters during the winter months. The mortality of eggs deposited was so great that the very important early run to the Fraser River was almost exterminated; thus, the adverse effect of overfishing the early run was over-shadowed by the subsequent high mortality of eggs deposited by those fish which did escape. Spawning conditions for the late escapement in 1959, principally to the Vedder and Harrison Rivers, were excellent hence the substantial reduction in the fry produced reflected the effect of overfishing.

Drastic regulatory action was taken in 1961 to start the rehabilitation of the Fraser pink runs which obviously were in a dangerous condition. The greatly increased restrictions on the fishery resulted in 76 per cent of the total run escaping to spawn as compared with only 17 per cent in the brood year. The escapement of 1,094,000 fish (Table XIV), while actually no greater than the poor escapement in the brood year, enjoyed what appears to have been excellent spawning and incubation conditions. If the fry survival is as favorable as is now anticipated, and if the water temperature of Georgia Strait is relatively cool during the summer season of 1962, a substantial increase can be expected in the 1963 Fraser River pink salmon population. However, the serious effects resulting from the adverse conditions in 1959 must be recognized. The rehabilitation of the Fraser River pink salmon populations to the levels prevailing in the years prior to 1915 has been severely impaired and only rigid regulation of a highly effective fishery combined with favorable environment will correct the situation.

Listed below are preliminary estimates for the percentage catches and escapements of major pink salmon runs in Convention waters for the years 1957, 1959 and 1961. The estimates are based on information gained from the 1959 tagging program conducted under the jurisdiction of the Pink Salmon Co-ordinating Committee[1] and are subject to possible revision after final analyses of the collected data are completed.

Calculated Catches and Escapements of Major Pink Salmon Runs
Entering Juan de Fuca Strait in 1957, 1959 and 1961
(All figures in per cent of total for each run.)

Area	*Washington*			*Fraser River**			*Canadian Non-Fraser**		
	1957	1959	1961	1957	1959	1961	1957	1959	1961
Canadian West Coast Convention Waters	20.8	19.7	12.8	21.1	31.6	9.2	17.3	10.0**	18.5
United States Convention Waters	11.7	12.7	9.1	39.4	42.8	9.7	29.0	38.5	36.9
Canadian Fraser River Catch	—	—	—	10.9	8.5	5.3***	—	—	2.7
Non-Convention Catch Canada	—	—	—	—	—	—	2.4	9.3	6.6
Non-Convention Catch United States	25.3	16.7	19.6	—	—	—	—	—	—
Escapement	42.2	50.9	58.5	28.6	17.1	75.8	51.3	42.2	35.3
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

* The figures listed do not include catches or escapements of fish entering Convention waters from Johnstone Strait.

** Strike of Canadian fishermen prevailed during part of run.

*** Catches in spring nets excluded.

The Commission carried out a co-ordinated pink salmon tagging program in 1961. The primary purpose of the tagging program was to provide additional information on the degree of spatial segregation of United States and Canadian pink salmon stocks during their passage through Juan de Fuca Strait. The results gave positive evidence that the run on the United States side of the Strait has a larger proportion of pink salmon destined for United States streams than has the run on the Canadian side. Conversely, the run on the Canadian side of the Strait has a larger proportion of fish destined for the Fraser and other Canadian streams.

Several parts of the management and research program for pink salmon initiated in 1957 and detailed in the 1959 Annual Report are either completed or approaching completion. Some items are of a continuing nature and other items now segregated for special consideration include a study of how water temperatures in Georgia Strait influence the population size and an analysis of the fishery to determine the historical abundance of pink salmon in the Fraser River watershed.

An artificial spawning ground adjacent to Seton Creek was completed during the summer of 1961. The spawning ground is 3,000 feet in length, 20 feet wide, is provided with a flow of 40 cubic feet per second, and has an estimated capacity of 10,000 fish. The natural population of pink salmon in Seton Creek was allowed unobstructed entry to the channel and 6,711 fish or

[1] Pursuant to the Pink Salmon Protocol as ratified July 3, 1957, the 1959 pink salmon program was organized and conducted under the jurisdiction of the Pink Salmon Co-ordinating Committee and its technical assistants. Membership in this committee consists of representatives of the Washington Department of Fisheries, the Canada Department of Fisheries, the Fisheries Research Board of Canada and the International Pacific Salmon Fisheries Commission.

11 per cent of the total run made use of the facility. Spawning efficiency was excellent and the number of fry emerging in the spring of 1962 will be counted to determine the productive efficiency of the area. A water supply failure occurred for two hours on October 18 and some mortality in the incubating eggs may have resulted. The cause of the failure in the water supply has since been corrected.

GENERAL INVESTIGATIONS

Research activities related to the management of the Fraser River sockeye populations were continued during the year in accordance with the procedures published in the 1955 Annual Report. The program was expanded in 1957 where applicable, to include Fraser River pink salmon. One of the most important activities has been directed towards the establishment of mortality rates during each of the distinct periods of the sockeye's life. Measurement of the survival rate for the various stages of life of the Chilko population has been continued each year beginning with the 1949 brood. The data for Chilko has been augmented by more limited observations on other Fraser sockeye populations. In the case of such important producing areas as the Stuart, Quesnel and Shuswap Lake systems, approximations have been made of the number of seaward migrants resulting from a recorded number of spawners.

In general, the survival during the freshwater life of the Fraser sockeye has been remarkably consistent throughout the period of observation. There has been a definite increase in the total number of downstream migrants and because of this fact the potential of the adult runs has been increased accordingly. There have been exceptions such as the excessive mortality of unspawned adults in 1953 because of high water temperatures prevailing in the Stuart and Quesnel spawning areas, but up until 1961 at least, adverse conditions rarely occurred and did not have a major influence on the average freshwater production of sockeye.

While survival in fresh water has been relatively consistent the marine survival of each year's downstream migration of fingerlings has fluctuated rather violently. The adults of all ages surviving from each brood year spawning at Chilko has varied from 6.03 per cent of the seaward migrants in the case of the 1953 brood year to 20.82 per cent of the seaward migrants for the 1954 brood year. In 1961 preliminary estimates indicate that the adult survival of Chilko seaward migrants from the 1957 brood year will be one per cent or less.

Since the fluctuation in the marine survival has a direct relation to the number of adults returning, a large variation in the marine survival rate from year to year has an important impact on both the industry and management. It is obvious from the degree of variation in the marine survival rate of seaward migrant sockeye, as shown above, that the prediction of adult runs based on the number of brood year spawners, fry produced, or even the number of seaward migrants would be of little practical value. A possible error in predicting run size that has a factor of one to twenty, is too great to permit the formulation of intelligent fishing regulations in advance of the season or to permit the necessary economic planning of the year's fishing operation within the industry.

Since the first survival studies commenced with the brood year at Chilko in 1949 and the first marine survival rates were established in 1953 there were not sufficient data until the present time to determine if there was some recorded

factor related to, or responsible for the fluctuation in marine survival. The establishment of a statistical relationship between the flow of the Fraser River at the time the migrants enter the estuary and their rate of marine survival (Figure 2A) necessitates an immediate study of the reasons for such a relationship.

Extensive exploratory observations will be made during the spring and summer of 1962 to record:

1. The reactions and distribution of the migrants in relation to saline water and temperature at and after the time they enter the estuarial area of the Fraser.
2. Growth and feeding habits during migration to the ocean as related to place and time.
3. The existence and character of predation.

It is hoped that the observations in 1962 will provide information for planning a direct investigation into the cause of the flow-survival relationship for, as stated in the introduction, "The forecasting of salmon survival on the basis of past relationships incorporates a serious weakness as long as the functioning of the factors used is not thoroughly understood."

Another method has been devised for predicting the size of sockeye runs to the Fraser River one year in advance. It appears from a study of the growth rate of the young sockeye during their first year in the sea that the percentage of the total population returning as three-year-olds is related, within practical limits, to the growth during that period. By recording the total number of three-year-olds returning in any one year and measuring their growth as revealed on their scales during their first year of marine existence the number of adults which will return the following year can be approximated. Such a relationship was established for several races but for the purpose of illustration data are presented only for Chilko (Figure 2B). While this method of prediction involves a mechanism which is understood, the existence of occasional exceptions merits further study. For example, the established relationship as shown in Figure 2B does not appear to apply to the Birkenhead population.

In 1958 the Commission published a study of the factors affecting the abundance of pink salmon in the Fraser River. The study revealed a close relationship of adult survival or abundance with temperature and salinity in Georgia Strait during the first few months after the young pink salmon fry reached the sea.

Marine observations were started in 1960 to explore the possible reasons for the existence of the above relationship. Young pink salmon were found in the shallow tidal areas throughout the Gulf and San Juan Islands shortly after their departure from the Fraser River. As the fish grew they sought deeper water until by mid-summer they were in the deeper and cooler channel areas. Since conditions for favorable survival prevailed in 1960 it was assumed that the character of the pink fry distribution was normal throughout the period of observation. On the basis of the 1960 observations it could be concluded that waters warmer than those prevailing might have caused the fish to react in a different manner. Water temperatures in some habitat areas might have exceeded the tolerance limits of the young fish. Warmer waters might have forced the young fish to seek the deeper and cooler water before they were capable of avoiding predators.

On the basis of the observations conducted in 1960 a more direct investigation is planned for 1962:

1. To record the variation, if any, in the habits of the young pink salmon from those observed in 1960, during the first few months of their marine existence.
2. To measure the reactions of pink salmon fry to variable water temperatures.
3. To assess the origin and extent of predation in relation to time and place.

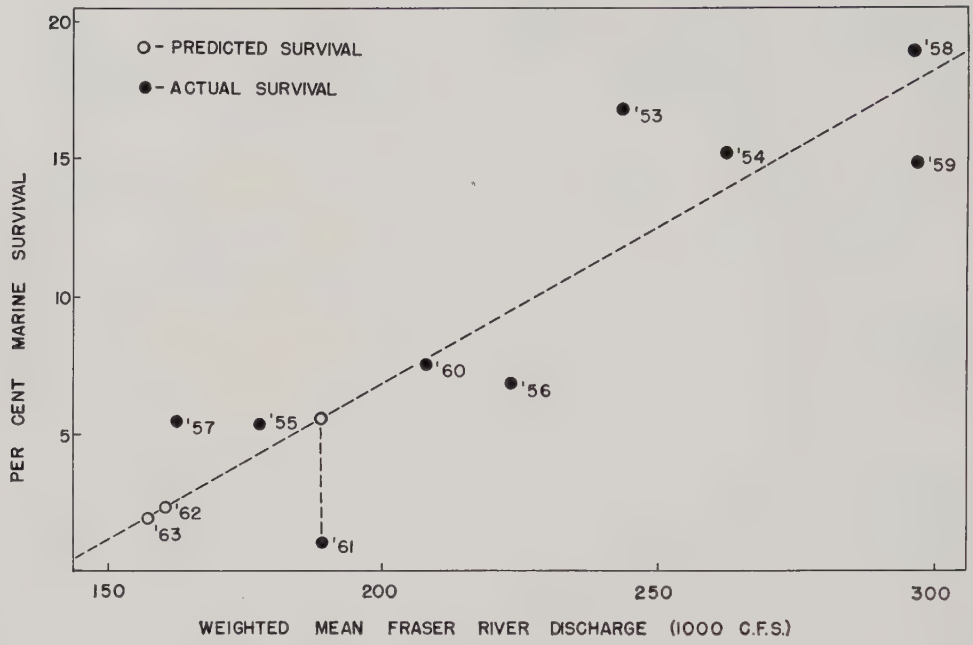

FIGURE 2A—Relationship between marine survival and Fraser River discharge, Chilko, (1953 - 1961).

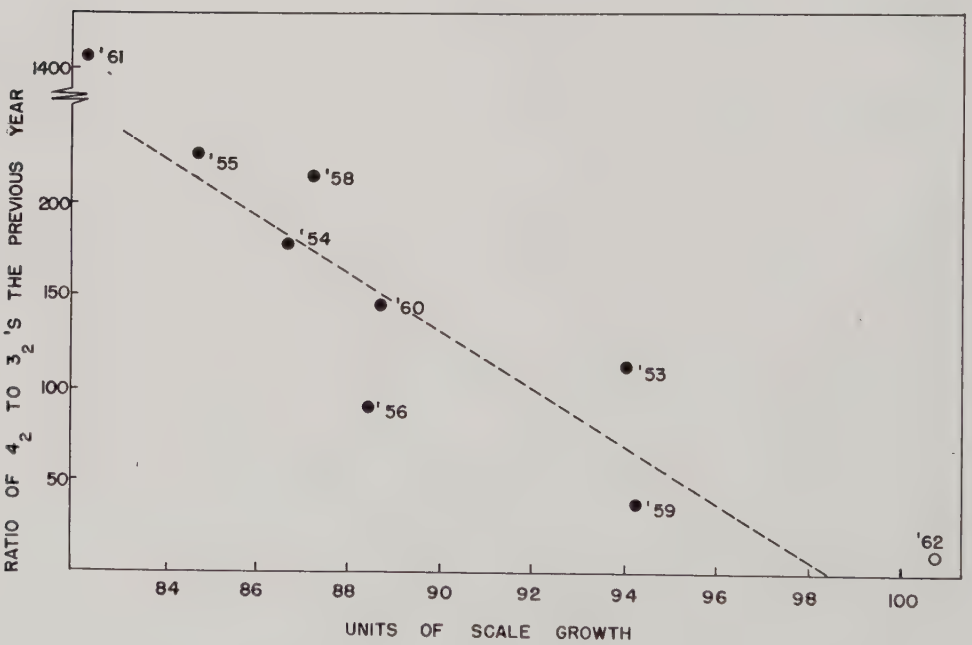

FIGURE 2B—Relationship between ratio of $4_2/3_2$ and first year marine growth—Chilko.

WATERSHED PROTECTION

Industrial development continues at a rapid pace within the Fraser River Basin and the related fisheries problems require considerable attention. The Canada Department of Fisheries is vested with the legal authority to obtain any fish protective facilities required and the Commission co-operates at a technical level in such matters, providing any information collected by it that may be essential to the maintenance of the Fraser River sockeye and pink salmon.

During recent months several inquiries have been received by the Canada Department of Fisheries with respect to the waste disposal aspects of kraft pulp mills under consideration in the vicinity of Prince George on the Fraser River. As a result of the above inquiries a co-operative study was made of the waste treatment and disposal problems and an interim report on the subject was issued by the two agencies in collaboration with the British Columbia Department of Recreation and Conservation.

Observations during the upstream migration of the Horsefly River sockeye run indicated that a delay in migration of one or two days occurred on the left bank of the Fraser River at Bridge River Rapids. Further investigation showed that the accumulation of fish was the result of the limited passage on the left bank and that after the peak in migration had passed there was no further accumulation of fish. Some minor improvements for passage along the left bank were made at the time of the investigation.

A study was continued of the factors affecting passage of early sockeye runs through the Fraser Canyon at high river levels and conditions affecting passage of sockeye and pink salmon through the Thompson River Canyon at low river levels. Preliminary designs were prepared for the facilities necessary to eliminate obstructions in the Fraser Canyon and to improve passage facilities in the Thompson River Canyon. Construction funds have been requested and, if provided, it is planned to have all corrective measures completed in time for the 1963 runs. During the investigation of fish passage problems in the Fraser River Canyon it was found that a rock pinnacle located 1,000 feet upstream from the Yale fishway, was one of the critical points of difficult passage. The rock pinnacle was removed in April, 1961 and Figures 3A and 3B illustrate the successful elimination of this particular obstruction to migration.

Early in October, it was found that pink salmon attempting to ascend Bridge River, four miles upstream from Lillooet, B.C., were having difficulty surmounting a rapids near the mouth of the river. While the temporary measures taken were sufficient to allow completion of the 1961 migration, permanent remedial facilities will have to be provided for unimpeded migration in future years.

FIGURE 3A—A rock pinnacle located 1000 feet above the Yale fishway, which was found to be a critical point in the upstream passage of early runs of sockeye.

FIGURE 3B—A picture of the Fraser River taken after the removal of the rock pinnacle shown above, illustrating the successful removal of the obstruction.

1961 PUBLICATIONS

1. Annual Report of the International Pacific Salmon Fisheries Commission for 1960.

2. Progress Report Number 8.
   Limnological Changes in Seton Lake Resulting from Hydroelectric Diversions by G. H. Geen and F. J. Andrew.

3. Research Bulletin Number XII.
   Racial Identification of Fraser River Sockeye Salmon by Means of Scales and Its Application to Salmon Management by Kenneth A. Henry.

4. An Interim Report on Proposed Kraft Pulp Mills on the Fraser River near Prince George with Recommendations for the Treatment and Disposal of Wastes (Mimeographed). Prepared by the technical staffs of the Canada Department of Fisheries and the International Pacific Salmon Fisheries Commission in collaboration with the British Columbia Department of Recreation and Conservation (Issued by the Canada Department of Fisheries).

TABLE I
SOCKEYE CATCH BY GEAR

United States Convention Waters

Year	Purse Seines			Gill Nets			Reef Nets			Total
	Units	Catch	Percentage	Units	Catch	Percentage	Units	Catch	Percentage	Catch
1961	273	823,956	59.76	574	471,464	34.20	77	81,826	5.94	1,378,392
1957	234	1,237,665	73.27	638	286,614	16.97	87	164,951	9.76	1,689,265
1953	247	1,355,734	66.70	322	427,836	21.05	96	248,867	12.25	2,032,437
1949	277	850,451	80.48	248	123,048	11.64	116	83,293	7.88	1,056,792

Canadian Convention Waters

Year	Purse Seines			Gill Nets			Traps			Total
	Units	Catch	Percentage	Units	Catch	Percentage	Units	Catch	Percentage	Catch
1961	101	352,883	26.00	1,550	991,972	73.10	0	0	0	1,357,099
1957	104	522,426	38.39	1,309	820,850	60.32	5	15,759	1.16	1,360,760
1953	66	600,449	30.14	1,482	1,331,823	66.85	4	60,071	3.01	1,992,343
1949	40	111,834	10.96	1,382	857,902	84.04	5	51,063	5.00	1,020,799

NOTE: Gear counts represent the maximum number of units delivering sockeye on any single day.
Unlisted troll catches of sockeye included in figures for total catch.

Table II
CYCLIC LANDINGS AND PACKS OF SOCKEYE FROM CONVENTION WATERS

	United States	*Canada*	*Total*
1961			
Total Landings (No. Sockeye)	1,378,392	1,357,099	2,735,491
Share in Fish	50.39%	49.61%	
Total Pack (48 lb. Cases)	119,197	116,231	235,428
Share in Pack	50.63%	49.37%	
1957			
Total Landings (No. Sockeye)	1,689,265	1,360,760	3,050,025
Share in Fish	55.39%	44.61%	
Total Pack (48 lb. Cases)	119,985	99,398	219,383
Share in Pack	54.69%	45.31%	
1946 - 1961			
Total Landings (No. Sockeye)	29,343,433	29,220,014	58,563,447
Share in Fish	50.11%	49.89%	
Total Pack (48 lb. Cases)	2,577,384	2,533,416	5,110,800
Share in Pack	50.43%	49.57%	
1961 *Cycle Catch*			
1961	1,378,392	1,357,099	2,735,491
1957	1,689,265	1,360,760	3,050,025
1953	2,032,437	1,992,343	4,024,780
1949	1,056,792	1,020,799	2,077,591
1945	706,464	969,444	1,675,908
1941	1,558,554	2,116,723	3 675,277
1937	897,022	1,075,986	1,973,008
1933	1,724,127	726,309	2,450,436
1929	1,334,141	725,037	2,059,178
1925	1,375,012	453,704	1,828,716
1921	1,199,929	486,312	1,686,241
1917	5,005,609	1,877,792	6 883,401
1913	21,736,398	9,606,641	31,343,039
1909	13,664,988	7,261,486	20,926,474
1905	10,330,277	10,350,959	20,681,236
1901	13,694,032	12,065,999	25,760,031

Table III

DAILY CATCH OF SOCKEYE, 1949-1953-1957-1961 FROM UNITED STATES CONVENTION WATERS

Date	JULY				AUGUST				SEPTEMBER			
	1949	1953	1957	1961	1949	1953	1957	1961	1949	1953	1957	1961
1		24,386	10,165		112,059			128,699	6,451	1,307		
2		32,371	11,833		66,263			75,733	4,114	1,050	7,288	
3		39,812	13,977	47,926	66,061					1,027	25,515	
4				43,037		53,277			4,205	2,944	19,653	
5				28,585	43,876	50,531	247,511		3,630			
6		48,620				24,955	135,265		2,195	1,104		
7		69,419				24,647			1,396	780		CLOSED
8		54,566	42,804		70,218				897	757		
9		57,159	57,639		52,151				564	892	1,852	
10		31,169	23,464	143,287	31,270	35,819		82,844		509	3,333	
11				89,786	27,071	31,244			452	604	4,583	
12					29,923	21,641	169,312		311		1,451	
13		15,334				18,034	121,946		216	423	5	
14		26,643				16,328	71,364		47	331		
15		33,817	39,662		31,651			18,748	28	339		
16		35,230	37,687		21,509			5,241	22	228	109	
17		21,961	33,138	49,754	22,065	18,173				637	610	
18				43,233	21,059	14,384			92	17	170	22
19				34,815	17,864	16,544	49,619		119			10
20						8,017	45,223		94	60		6
21		175,068			19,173	14,939	28,689	11,491	41	22		
22		109,925	95,124		15,040		27,606	6,038	16	5		
23		165,742	78,735		16,475				28	8	24	
24			52,762	199,232	12,852	14,521				9	29	
25	3,916			117,345	9,725	8,796			23		8	11
26	43,196			73,843	12,924	6,949	22,237		25			33
27	116,793	213,804				7,891	16,538		24	1		10
28	82,812	147,109			8,262	6,569	12,724		6			
29	44,979	77,777	63,287		6,052		7,420		1			
30		90,768	61,061		5,768	2,574				11		
31			46,297	161,484	8,678	2,860						
Totals	291,696	1,470,680	667,635	1,032,327	727,989	398,693	955,454	328,794	24,997	13,065	64,630	92
Troll and outside seine		31,396		750	11,966	38,496		380	144	60		
Monthly Totals	291,696	1,502,076	667,635	1,033,077	739,955	437,189	955,454	329,174	25,141	13,125	64,630	92
June, Oct. & Nov. Totals										80,047	1,546	16,049
Season Totals									1,056,792	2,032,437	1,689,265	1,378,392

CLOSED

CLOSED

TABLE IV

DAILY CATCH OF SOCKEYE, 1949-1953-1957-1961 FROM CANADIAN CONVENTION WATERS

Date	JULY				AUGUST				SEPTEMBER			
	1949	1953	1957	1961	1949	1953	1957	1961	1949	1953	1957	1961
1	CLOSED	33,417	19	STRIKE RELIEF FISHING	154,935		36,393	109,677	4,683	4,397		
2		36,323	274		83,461				772	4,038	9,419	
3		2,287	1,658	36,879	68,945	91,326				4,797	4,956	
4			1,157	7,930	63,618	54,086				246	3,328	
5					50,283	48,611	83,204		5,622		1,920	53
6		72,602				38,493	138,428		2,413		1,619	18
7		36,926				6,820	52,297		1,704	6,321		
8		22,165	68		73,872				1,302	5,136		
9		27,665			35,418			28,636	177	6,556	67	
10		2,500	4,529	109,597	24,834	20,889		23,368		7,067	11,153	
11			67	27,730	36,180	60,670				89	6,060	
12				34,089	400	37,370	37,115		3,811		3,340	7
13		28,227		46,966		36,956	104,138	52,261	3,558		1,833	4
14		16,936				19,232	81,215	18,609	5,437	32		
15		21,295			32,850		85,221	21,972	4,373	14		
16		24,817	31,184		16,564			7,407	2,934	14,700	2,753	
17		4,809	17,143	86,946	15,140	31,843				8,126	4,224	
18			17,281	44,527	15,358	13,370				2	2,102	
19	2,043				1,419	10,734	24,722		2,084		763	2
20	2,102	93,156				13,397	62,386		1,709		924	3
21	1,443	128,664				7,066	40,463	17,815	1,689			2
22	1,440	112,022	72,300		15,697		31,909	5,898	1,321			
23		87,223	82,253		7,780							
24			53,025	217,241	6,792	10,945				CLOSED	1	
25	38,191		20,679	153,593	6,699	4,916						
26	28,963			98,121	290	2,929	25,088		6,139			11
27	49,822	40,629				4,860	12,623		1,544			
28	64,646	249,362				1,024	9,799	5,630	455			1
29	4,425	130,898	13,254		12,778		1,836	1,831	1,266			
30		140,486	83,664		4,585							
31		7,932	75,599	179,254	4,189	6,869						
Totals	193,075	1,320,341	474,154	1,042,837	732,087	522,406	826,837	293,104	52,993	61,521	54,462	101
Troll and outside seine	1,995		662	4,976	22,716	474	1,001	2,363	114		37	4,236
Spring Salmon gill nets										212		625
Monthly Totals	195,070	1,320,341	474,816	1,047,849	754,803	522,880	827,838	295,467	53,107	61,733	54,499	4,962
June, Oct. & Nov. Totals									17,819	87,389	3,607	8,821
Season Totals									1,020,799	1,992,343	1,360,760	1,357,099

Table V
THE INDIAN CATCHES OF SOCKEYE SALMON BY DISTRICTS AND THE VARIOUS AREAS WITHIN THESE DISTRICTS, 1957, 1961

District and Area	1957		1961	
	Catch	*No. of Fishermen*	*Catch*	*No. of Fishermen*
HARRISON-BIRKENHEAD				
Skookumchuck and Douglas	1,180		770	37
Birkenhead River and Lillooet Lake	3,830		4,590	10+
Harrison and Chehalis	550		1 200	25
TOTALS	5,560		6.560	
LOWER FRASER				
Coquitlam to Chilliwack	5,425		20,016	115+
Chilliwack to Hope	2,190		15,170	140
Vedder River and Vicinity			15,759	60
TOTALS	7,615		50.945	
CANYON				
Hope to Lytton	15,200		33,000	
TOTALS	15.200		33.000	120
LYTTON-LILLOOET				
Lytton to Lillooet	6,400		5.600	
TOTALS	6,400		5,600	67
BRIDGE RIVER RAPIDS				
Rapids	11,100		8,400	
Pavillion	600		1,500	
TOTALS	11,700		9.900	135
CHILCOTIN				
Farwell Canyon	1,486		942	
Hances Canyon	1,512		1,337	
Alexis Creek	5,710		630	
Siwash Bridge	4,394		963	
Keighley Holes	1,590		0	
TOTALS	14,692	63*	3 872	60
UPPER FRASER				
Shelley	180		38	
Alkali and Canoe Creek	400		275	
Chimney Creek	3,823		1,555	
Soda Creek	780		550	
Alexandria	230		425	
Quesnel	575		400	
TOTALS	5,988	82	3,243	73
NECHAKO				
Nautley Reserve	4,481	11	4,136	19
Stella Reserve	2,842	12	1,881	16
TOTALS	7,323	23	6,017	35
STUART				
Fort St. James	11,628	57	11,163	47
Tachie, Pinchi & Trembleur Villages	6,421	23	5,888	55
TOTALS	18,049	80	17,051	102
THOMPSON				
Main Thompson River	2,045		835	89
North Thompson River	1,685		95	42
South Thompson River	240		410	102
TOTALS	3,970		1,340	233
GRAND TOTALS	96,497		137,528	

* Number of permits issued to Indians in district.

The Indian catch statistics detailed above are obtained principally from the Protection Officers of the Canadian Dept. of Fisheries. These officers control the taking of sockeye for food by the Indian population residing throughout the Fraser River watershed.

TABLE VI

SUMMARY OF THE SOCKEYE ESCAPEMENT TO THE FRASER RIVER SPAWNING AREAS, 1949, 1953, 1957, 1961

District and Streams	1961 Period of Peak Spawning	Estimated Number of Sockeye				Jacks	Sex Ratio	
		1949	1953	1957	1961		Males 4-5 yr.	Females 4-5 yr.
LOWER FRASER								
Cultus Lake	Nov. 25-28	9,301	13,000	20,647	15,428	2,032	6,363	7,033
Upper Pitt River	Sept. 12-18	9,500	18,693	12,338	11,162	4	4,540	6,618
Pitt Lake	——	——	350	——	——			
Widgeon Slough	Oct. 28-Nov. 1	650	1,518	1,200	1,293	2	681	610
HARRISON								
Big Silver Creek	Sept. 19-26	2,100	432	389	398	0	199	199
Harrison River	Nov. 10-18	8,000	21,328	3,812	42,778	5	20,829	21,944
Weaver Creek	Oct. 18-21	12,520	9,530	20,887	4,383	137	1,855	2,391
Misc. Streams	——	310	86	——	11	0	5	6
LILLOOET								
Birkenhead River	Sept. 24-28	74,300	53,111	24,168	49,627	17,946	15,322	16,359
SETON-ANDERSON								
Gates Creek	Aug. 29-Sept. 3	——	78	1,112	252	4	124	124
Portage Creek	Oct. 25-28	——	200	470	527	504	11	12
SOUTH THOMPSON								
Seymour River	Aug. 31-Sept. 2	10,772	5,947	14,095	5 822	2,200	1,492	2,130
Scotch Creek	Aug. 30-Sept. 3	1,000	1,364	2,354	598	0	257	341
Lower Adams River	Oct. 21-23	11,700	177,000	257,614	57,796	56,364	616	816
Little River	Oct. 21-23	9,615	32,118	34,964	8,253	8,070	79	104
South Thompson River	Oct. 21-23	5	12,614	14,645	254	250	1	3
NORTH THOMPSON								
Raft River	Sept. 3-6	5,900	8,242	7,264	7,301	8	3,280	4,013
Barriere River	Sept. 6-8	——	——	38	335	0	163	172
North Thompson River	Oct. 1-3	——	——	——	225	0	112	113
CHILCOTIN								
Chilko River	Sept. 24-27	59,000	197,660	140,765	40,315	1,214	15,515	23,586
Taseko Lake	——	100	4,422	3,667	80	0	40	40
QUESNEL								
Horsefly River	Aug. 28-Aug. 31	20,000	105,218	226,378	295,705	9	115,826	179,870
Mitchell River	Sept. 4-6	350	2,344	2,677	6,601	0	2,574	4,027
NECHAKO								
Endako River	——	1,100	605	110	0	0	0	0
Nadina River (Early)	Aug. 25-27	21,600	38,574	30,000	18,885	2	7,473	11,410
Nadina River (Late)	Sept. 20-23	——	——	29,146	17,544	2	8,768	8,774
Nithi River	Aug. 31-Sept. 3	1,400	1,208	1,186	146	0	67	79
Ormonde Creek	——	2,500	956	450	0	0	0	0
Stellako River	Sept. 26-29	104,800	45,057	38,922	47,241	378	21,391	25,472
STUART								
Early Runs								
Ankwil Creek	Aug. 2-6	750	5,913	8,285	18,468	0	8,390	10,078
Bivouac Creek	Aug. 2-6	12,900	8,994	9,464	997	0	541	456
Driftwood River	Aug. 11-13	450	8,655	45,567	81,617	90	36,662	44,865
Dust Creek	Aug. 2-6	7,800	16,891	14,827	10,870	25	3,833	7,012
Felix Creek	Aug. 1-5	——	805	7,081	3,082	4	1,384	1,694
15 Mile Creek	Aug. 2-6	200	794	511	922	0	395	527
5 Mile Creek	Aug. 2-6	600	2,632	3,821	731	0	352	379
Forfar Creek	July 31-Aug. 3	80,500	18,054	17,975	13,599	26	6,171	7,402
Forsythe Creek	Aug. 2-6	1,200	4,500	6,385	5,836	0	2,738	3,098
Frypan Creek	Aug. 2-6	750	4,566	3,890	10,595	0	5 210	5,385
Gluske Creek	July 31-Aug. 3	106,000	16,074	21,899	5,652	6	2,801	2,845
Kynoch Creek	July 31-Aug. 3	185,400	16,676	13,473	16,170	38	6,579	9,553
Leo Creek	Aug. 2-6	1,700	6,361	10,620	1,624	0	743	881
Narrows Creek	Aug. 2-6	20,700	20,604	16,184	7,897	13	3,625	4,259
Paula Creek	Aug. 2-6	——	1,406	7,918	1,400	0	651	749
Rossette Creek	July 31-Aug. 3	152,900	6,355	7,087	4,993	21	2,080	2,892
Sakeniche River	Aug. 2-6	150	3,382	6,340	5,278	0	2,441	2,837
Sandpoint Creek	Aug. 2-6	——	2,092	20,914	3,523	4	1,635	1,884
Shale Creek	Aug. 2-6	3,000	3,809	1,606	2,392	0	804	1,588
25 Mile Creek	Aug. 2-6	3,300	2,167	724	1,663	0	770	893
Misc. Streams	Aug. 2-6	1,112	3,392	10,462	3,911	4	1,764	2,143
Late Runs								
Kazchek Creek	Sept. 15-18	1,500	7,903	19,582	15,676	0	5,366	10,310
Kuzkwa Creek	Sept. 18-21	——	3,686	50,006	39,245	24	14,638	24,583
Middle River	Sept. 15-18	126,400	235,572	332,098	177,516	100	75,716	101,700
Pinchi Creek	Sept. 15-18	——	72	6,390	527	0	192	335
Sakeniche River	Sept. 15-18	——	104	592	1,094	0	440	654
Tachie River	Sept. 19-24	20,000	107,506	118,252	177,047	94	66,044	110,909
NORTHEAST								
Upper Bowron River	——	22,283	13,517	12,069	7,460	11	3,286	4.163
TOTALS		1,116,118	1,274,346	1,663,320	1,253,012	89,591	482,939	680,482

Table VII

DAILY CATCH OF SOCKEYE, 1946-1950-1954-1958 FROM UNITED STATES CONVENTION WATERS

Date	JULY				AUGUST				SEPTEMBER			
	1946	1950	1954	1958	1946	1950	1954	1958	1946	1950	1954	1958
1			1,332		10,836	15,403			53,804		472,636	170,818
2			6,000		8,874	20,880	30,780		131,748		446,988	326,983
3						25,058	39,131		92,579		173,977	218,732
4					12,163		40,284	27,722	71,241			182,785
5			16,232		7,745		29,590	17,753	62,452			255,742
6			8,509		15,543	16,961	33,758	9,482	79,725		117,704	361,549
7			6,623	CLOSED	34,586	34,588				951	115,016	278,614
8			12,660		47,960	48,134			41,085	712	66,966	251,967
9			8,676		38,902	41,470	91,674		94,111		71,330	270,105
10						36,990	105,771		103,522	206	42,100	99,657
11	CLOSED	CLOSED			23,838		90,326	47,540	92,895	392	10,441	83,545
12			22,095		23,799		97,704	52,692	13,347	296	7,646	74,324
13			18,854		29,522	55,865	46,749	48,236	7,562	52	8,952	71,025
14			10,979		35,193	26,563				62	8,796	100,305
15			10,248		34,903	18,115			8,342	40	10,409	44,837
16			12,450		43,047	36,042	36,495		8,599		2,412	22,421
17						52,889	72,456		21,893	898	1,229	80,171
18					27,381		39,634		9,173	483	635	13,319
19			38,708		43,713		28,883		11,005	2,427	397	4,598
20			30,317		63,070	138,217	58,703	51,984	705	365	1,328	
21			27,814	4,014	64,503	153,568		67,331		124	1,399	
22			24,719	6,199	55,089		91,515	62,943	4,882	67	1,239	22,260
23			32,708	4,346	54,416	100,173	114,790		2,197		457	277,405
24						131,748	83,238		1,696	12	308	6,769
25	305				89,452	107,788	131,074	162,816	1,846	21	24	17,815
26	87				134,956		154,114	116,752		14	358	
27			74,196		290,642	83,504	232,693	156,081	CLOSED	17	401	
28	172		51,039	19,972	542,836	38,212		195,990		18	430	
29	321		43,155	10,697	366,879		406,321	218,385		11	159	42,564
30	189		35,233	8,253	531,426	16,818	291,987	249,106			96	145,499
31	4,302	14,286					359,793	173,652				
Totals	5,376	14,286	492,547	53,481	2,631,274	1,198,986	2,707,463	1,658,465	914,409	7,168	1,563,833	3,423,809
Troll and outside seine			3,566	26	247		32,348	1,092		453		109
Monthly Totals	5,376	14,286	496,113	53,507	2,631,521	1,198,986	2,739,811	1,659,557	914,409	7,621	1,563,833	3,423,918
June, Oct. & Nov. Totals									4		6,501	120,334
Season Totals									3,551,310	1,220,893	4,806,258	5,257,316

TABLE VIII

DAILY CATCH OF SOCKEYE, 1946-1950-1954-1958 FROM CANADIAN CONVENTION WATERS

Date	JULY				AUGUST				SEPTEMBER			
	1946	1950	1954	1958	1946	1950	1954	1958	1946	1950	1954	1958
1			2,203	831	946	25,874				312	91,014	385,773
2			250	1,695	947	26,390	152,014		67,498		152,294	466,479
3						30,775	72,397		146,709	120	120,470	401,799
4							34,165	22,502	190,107	19,760		458,172
5			14,594		72		58,122	7,241	144,135	12,062	9,963	175,892
6			10,423		230	11,031	36,874	5,521	93,529	26,320	166,818	
7			7,710	7,239	71	53,074				978	128,713	
8			7,809	4,918	14,075	31,653				150	96,413	159,126
9			495	7,149	7,475	20,121	398		120,686		101,374	199,470
10						21,189	3,731		84,121	307	148,585	141,025
11						296	3,731	36,583	599,942	50		145,470
12	CLOSED	CLOSED	9,652		61,254		3,732	13,238	80,620	50		130,616
13			8,436		29,700	14,679	398	14,050	312,505	58	206,257	
14			7,172	14,098	21,513	49,953				16	151,204	
15			7,135	11,789	16,307	29,973				16	180,631	2,486
16			1,783	16,213	18,042	32,366	198,415		327,366		85	2,192
17						38,300	92,423		218,704	16	569	1,974
18							80,050		162,323	15	901	597
19			18,778		53,008		55,805		151,372	15	904	307
20			12,751		22,382	71,775	6,313	105,922	82	15	356	
21			10,854	12,140	22,574	42,085		241,232		10	606	
22			15,976	6,642	27,513	29,217		284,595		8	313	119
23			8,810	9,276	33,499	45,742	158,921		356,118		307	74
24						52,525	235,021		202,150	2	97	66
25	275					21,972	213,480	196,072	25	29,233	47,355	35
26	275		71,411		165,805		539,669	219,024		10,835	15,658	789
27			41,306		324,065	3,118	265,408	339,029	CLOSED	10,663	10,204	
28			33,001	19,301	89,112	40,252		315,589		4,980	19,086	
29	187		33,306	9,497	36,545	19,577		195,690			9,287	1,198
30	188		17,346	11,443	29,361	13,918	520,136				4,435	391
31	188	31,679				7,737	48,441					
Totals	1,113	31,679	341,201	132,231	974,496	733,592	2,689,644	1,996,288	3,257,992	115,991	1,663,899	2,674,050
Troll and outside seine			3,356	350			10,283	3,373			103	1,131
Spring Salmon gill nets	1,027				1,126							263
Monthly Totals	2.140	31,679	344,557	132,581	975,622	733,592	2,699,927	1,999,661	3,257,992	115,991	1,664,002	2,675,444
June, Oct. & Nov. Totals									4,444	13,207	13,977	433,931
Season Totals									4,240,198	894,469	4,722,463	5,241,617

Table IX

SUMMARY OF THE SOCKEYE ESCAPEMENT TO THE FRASER RIVER SPAWNING AREAS, 1946, 1950, 1954, 1958

District and Streams	1958 Period of Peak Spawning	Estimated Number of Sockeye			
		1946	1950	1954	1958
LOWER FRASER					
Cultus Lake	Nov. 25-Dec. 1	33,284	30,595	23,756	14,097
Upper Pitt River	Sept. 15-23	18,520	42,800	17,624	10,385
Widgeon Slough	Nov. 5-10	1,404	600	1,000	1,152
HARRISON					
Big Silver Creek		——	25	279	——
Harrison River	Nov. 10-15	15,631	33,860	28,800	14,701
Weaver Creek	Oct. 20-25	36,000	30,700	28,773	36,199
Misc. Streams		1,200	350	——	——
LILLOOET					
Birkenhead River	Sept. 26-29	90,000	72,767	41,201	33,055
SETON-ANDERSON					
Gates Creek	Sept. 12-14	——	——	47	81
Portage Creek	Nov. 7-11	——	few	3,505	4,803
SOUTH THOMPSON					
Seymour River	Sept. 7-10	2,600	12,000	26,258	78,575
Upper Adams River	Sept. 9-12	0	0	205	Present
Lower Adams River	Oct. 25-Nov. 5	1,841,000	850,500	1,552,820	1,730,609
Little River	Nov. 1-8	419,000	376 000	427,850	409,480
South Thompson River	Nov. 1-8	92,000	41,500	87,611	123,864
Lower Shuswap River	Nov. 3-5	——	——	17,462	9,387
Middle Shuswap River	Oct. 28-Nov. 3	0	0	0	499
Diverted Sockeye		0	0	0	1,006,177
NORTH THOMPSON					
Raft River	Sept. 5-9	3,000	6,400	10,551	10,215
CHILCOTIN					
Chilko River	Sept. 27-30	58,950	29,800	36,534	137,081
Taseko Lake	Sept. 3-6	——	500	3,500	7,538
QUESNEL					
Horsefly River	Sept. 7-10	58	400	279	1,784
Mitchell River	Sept. 23-25	2	0	18	65
Little Horsefly River	Oct. 15-20	——	——	——	14
NECHAKO					
Endako River	Sept. 1-3	368	900	Present	522
Nadina River	Sept. 12-18 (Early)				
	Sept. 20-24 (Late)	66	1,950	2,219	804
Nithi River		4	125	46	5
Ormonde Creek	Sept. 5-7	193	732	538	210
Stellako River	Sept. 29-Oct. 4	245,200	145,100	142,632	112,273
Uncha Creek	Sept. 24-26	——	——	——	25
STUART LAKE					
Early Runs					
Ankwil Creek	Aug. 16-20	——	67	56	461
Bivouac Creek		——	2,320	387	3
Driftwood River	Aug. 16-22	5	144	387	1,897
Dust Creek	Aug. 4-12	——	1,125	1,168	3,017
Felix Creek	Aug. 3-6	——	——	218	515
15 Mile Creek	Aug. 16-20	——	54	41	105
5 Mile Creek	Aug. 16-20	——	262	5	111
Forfar Creek	Aug. 4-12	1,822	10 259	5,702	8,715
Forsythe Creek		——	2	27	0
Frypan Creek	Aug. 16-20	——	69	266	57
Gluske Creek	Aug. 4-12	2,905	11,007	5,292	1,642
Kynoch Creek	Aug. 3-12	1,843	24,644	14,088	9,477
Leo Creek	Aug. 9-12	——	97	4	234
Narrows Creek	Aug. 4-12	277	2,265	2,756	1,823
Paula Creek	Aug. 3-6	——	——	36	333
Rossette Creek	Aug. 3-12	2,641	6 260	3,836	3,735
Sakeniche River	Aug. 9-12	——	234	——	500
Sandpoint Creek	Aug. 4-12	——	——	508	875
Shale Creek	Aug. 16-20	61	628	279	657
25 Mile Creek	Aug. 16-20	——	521	207	218
Misc. Streams	Aug. 4-20	——	42	23	258
Late Runs					
Kazcheck Creek	Sept. 17-20	60	243	83	369
Middle River	Sept. 17-24	488	2,600	3,927	7,762
Pinchi Creek	Oct. 6-12	——	——	5	850
Tachie River	Sept. 18-24	14	200	1,529	13,738
NORTHEAST					
Upper Bowron River		6,951	16,266	10,774	14,871
TOTALS		2,875,547	1,756,913	2,485,112	3,815,823

TABLE X

PINK CATCH BY GEAR

United States Convention Waters

Year	Purse Seines			Gill Nets			Reef Nets			Troll		Total
	Units	Catch	Percentage	Units	Catch	Percentage	Units	Catch	Percentage	Catch	Percentage	Catch
1961	199	344,214	67.69	360	71,924	14.14	79	28,513	5.61	63,893	12.56	508,544
1959	317	1,913,555	78.83	446	227,643	9.38	81	110,416	4.55	175,921	7.24	2,427,535
1957	351	2,216,119	79.79	638	246,296	8.87	99	149,094	5.37	165,248	5.95	2,777,366
1955	359	4,037,448	86.15	395	306,744	6.55	95	276,848	5.91	64,932	1.39	4,685,984

Canadian Convention Waters

Year	Purse Seines			Gill Nets			Traps			Troll		Total
	Units	Catch	Percentage	Units	Catch	Percentage	Units	Catch	Percentage	Catch	Percentage	Catch
1961	82	313,636	57.53	1,116	142,518	26.14	0	0	0	88,974	16.33	545,128
1959	133	1,357,088	58.68	1,291	693,977	30.00	0	0	0	261,841	11.32	2,312,906
1957	105	1,435,924	54.50	1,473	1,126,085	42.74	5	31,309	1.19	41,402	1.57	2,634,720
1955	104	2,931,552	71.00	1,400	1,039,406	25.17	5	126,036	3.05	32,069	0.78	4,129,063

NOTE: Gear counts represent the maximum number of units delivering pinks on any single day.

Table XI

LANDINGS AND PACKS OF PINK SALMON FROM CONVENTION WATERS

	United States	*Canada*	*Total*
1961			
Total Landings (No. of Pinks)	508,544	544,719	1,053,263
Share in Fish	48.28%	51.72%	
Total Pack (48 lb. Cases)	49,129	52,273	101,402
Share in Pack	48.45%	51.55%	
1961 Catch	508,544	544,719	1,053,263
1959	2,427,535	2,312,906	4,740,441
1957	2,777,366	2,634,720	5,412,086
1955	4,685,984	4,129,063	8,815,047
1953	4,951,429	4,142,117	9,093,546
1951	5,086,284	2,885,514	7,971,798
1949	6,235,400	3,189,662	9,425,062
1947	8,801,595	3,491,416	12,293,011
1945	5,458,890	1,279,849	6,738,739

Table XII

DAILY CATCH OF PINKS, 1955-1957-1959-1961 FROM UNITED STATES CONVENTION WATERS

Date	JULY				AUGUST				SEPTEMBER			
	1955	1957	1959	1961	1955	1957	1959	1961	1955	1957	1959	1961
1		1			9,370			34,070	144,389		187,274	
2					16,341			27,621		308,214	157,077	
3				34	10,279		6,110			344,634		
4	6			61			10,378		154,128	198,795		
5	17			38		17,545	13,181		113,207			
6	10					12,487	12,221		167,703			
7	4				10,114		13,229		137,636		108,145	
8					24,948		9,036		55,612		153,233	CLOSED
9		7	CLOSED		19,202					143,732	133,600	
10		1		494	16,197		10,105	64,389		82,101	132,028	
11	36			398	10,225		16,642		141,602	115,338		
12	106					24,436	17,634		131,375	56,951		
13	111					43,316	19,633		24,818	786		
14	122				20,165	57,329			76,532			
15		108			23,491			45,358	38,369		41,645	
16		235			26,193			21,451		40,133	30,919	
17		164		6,592	47,162		57,658			50,380	14,021	
18	583			8,234	38,138		41,664		149,735	35,730		4,023
19	736			12,592	2,488	99,644	36,950		104,360	146		1,790
20	658		1,063			89,534			81,676	49		1,265
21	515		1,533		66,618	80,747		72,620	68,999			
22		1,423	1,127		65,570	110,833		51,641	66,773		8,427	
23		1,371			136,472		10,524			18,459	8,204	
24		1,193		25,288	122,729		316,210			12,369	4,195	
25	1,737			20,603	91,280		232,534	CLOSED	102,199	5,890	1,134	540
26	890			18,595		228,828	59,823		29,277			463
27	1,785		3,545			189,603	125,179		43,543			76
28	1,827		5,506		228,497	133,673			46,725			
29		1,837	5,114		135,610	97,861			15,696		3,790	
30		3,386	4,276		162,752						2,106	
31		2,848		24,759	161,889		232,046				2,252	
Totals	9,143	12,574	22,164	117,688	1,445,730	1,185,836	1,240,757	317,150	1,894,354	1,413,707	988,050	8,157
Troll and outside seine	4,830	42,145	40,259	20,449	778,434	102,386	126,019	40,671	540,117	10,748	6,545	1,683
Monthly Totals	13,973	54,719	62,423	138,137	2,224,164	1,288,222	1,366,776	357,821	2,434,471	1,424,455	994,595	9,840
June, Oct. & Nov. Totals									13,376	9,970	3,741	2,746
Season Totals									4,685,984	2,777,366	2,427,535	508,544

Table XIII

DAILY CATCH OF PINKS, 1955-1957-1959-1961 FROM CANADIAN CONVENTION WATERS

Date	JULY				AUGUST				SEPTEMBER			
	1955	1957	1959	1961	1955	1957	1959	1961	1955	1957	1959	1961
1		2			7,169	343		14,821	137,320		117,313	
2		1			6,943				67,163	192,149	89,335	
3		1		1	16,178					180,181	99,848	
4	17	6		1	11,082		13			147,730	19,653	
5	5	7				20,779			299,702	91,813		3,335
6	6					41,304			175,474	58,796	95,733	2,198
7	13					43,086			182,104		52,704	
8		6				162			136,765		92,362	
9		6			32,507	163		18,773	117,875	20,398	131,918	
10		6		4	45,148		25,687	22,031		113,427	88,337	
11	51	10		4	52,906		24,563			96,826	9,774	
12	115	10		6	40,857	88,365	24,718		94,543	57,295		936
13	93			29		53,273	34,625	4,954	228,496	40,518		569
14	181					116,580		3,753	191,906		29,041	
15		22			67,273	79,958		80,913	31,326		57,720	
16		33			72,500			56,892	4,719	44,764	45,086	
17		55		13,807	76,519		40,111			70,693	37,960	
18	818	101		8,909	63,697		29,604			33,112	1,169	
19	522	19			94,825	79,913	1,749		19,245	42,847		344
20	1,020		1,603			77,578			10,069	66,096		260
21	1,494		1,807			91,077		15,144	4,989		20,122	431
22		3,091	2,880		154,777	110,547		39,029	4,543		17,566	
23		7,849			163,202		201,421		3,112	1,455	36,721	
24		5,078		27,564	212,995		225,659			1,628	22,104	
25	4,684	206		22,427	211,931		146,148			1,498		
26	6,145			18,841	267,348	113,470	98,483		1,046	226		89
27	3,838					84,368			671	139		30
28	3,097					114,618		5,480	1,060		93	22
29		2,078			251,150	164,983		12,061	240		202	
30		8,170			238,032				373	10	63	
31		14,928		9,097	170,565		123,443					
Totals	22,099	41,685	6,290	100,690	2,257,604	1,280,567	976,224	273,851	1,712,741	1,261,601	1,064,824	8,214
Troll and outside seine	2,216	3,398	27,542	26,208	46,117	30,460	179,795	34,659	12,052	4,788	44,467	20,038
Spring salmon Gill Net									6,888		482	37,330
Monthly Totals	24,315	45,083	33,832	126,898	2,303,721	1,311,027	1,156,019	308,510	1,731,681	1,266,389	1,109,773	65,582
June, Oct. & Nov. Totals									69,346	12,221	13,282	44,138
Season Totals									4,129,063	2,634,720	2,312,906	545,128

CLOSED JULY 26 - AUG. 9 STRIKE

TABLE XIV

SUMMARY OF THE PINK SALMON ESCAPEMENT TO THE FRASER RIVER SPAWNING AREAS

District and Streams	*Period of Peak Spawning*	*Estimated Number of Pink Salmon* 1957	1959	1961
EARLY RUNS				
LOWER FRASER				
Main Fraser	Sept. 25-Oct. 5	1,263,651	733,933	549,400
HARRISON				
Chehalis River	Oct. 5-12	9,336	6,729	11,921
FRASER CANYON				
Coquihalla River	Oct. 2-7	4,433	16,088	7,316
Jones Creek	Sept. 23-30	1,493	2,604	5,088
Lorenzetti Creek	Oct. 1-10	6	991	218
Silver Creek	Oct. 1-5	549	1,914	705
Hunter Creek	Oct. 1-10	13	234	140
American Creek	Oct. 1-10	4	790	147
Spuzzum Creek	Oct. 2-20	1,076	2,111	263
Nahatlatch River	Oct. 2-5	208	216	244
Anderson Creek	Oct. 1-10	824	567	166
Stein River	Oct. 2-5	185	62	83
Churn Creek	——	8	0	0
Texas Creek	——	0	195	0
Popkum Creek	——	0	57	0
Flood Creek	——	0	8	0
Yale Creek	Oct. 1-10	0	510	31
Emory Creek	Oct. 1-10	0	728	22
Stoyoma Creek	——	0	42	0
Kawkawa Creek	Oct. 13-20	317	1,279	502
Ruby Creek	Oct. 5-12	0	528	448
SETON-ANDERSON				
Seton Creek	Oct. 1-8	58,810	14,887	58,717
Portage Creek	Oct. 1-5	1,867	52	1,550
Bridge River	Oct. 5-10	0	1,201	1,895
Yalakom River	——	0	13	0
THOMPSON				
Thompson River	Sept. 28-Oct. 8	266,329	86,342	69,179
Nicola River	Oct. 4-10	1,560	806	216
Bonaparte River	Sept. 27-29	653	3	8
Deadman River	Sept. 18-20	564	0	8
Nicoamen River	——	0	73	0
TOTAL		1,611,886	872,963	708,267
LATE RUNS				
LOWER FRASER				
Stave River	Oct. 20-25	6,500	1,383	3,994
Whonnock Creek	Oct. 20-25	549	57	278
Suicide Creek	——	2	0	0
Silverdale Creek	Oct. 20-25	52	68	88
Kanaka Creek	Oct. 20-25	153	18	23
South Alouette River	——	8	0	0
North Alouette River	——	8	0	0
Silver Creek (Pitt Lake)	——	239	0	0
Coquitlam River	——	6	0	0
HARRISON				
Harrison River	Oct. 13-20	585,798	110,311	186,137
Weaver Creek	Oct. 8-14	346	87	539
CHILLIWACK-VEDDER				
Chilliwack-Vedder River	Oct. 15-20	212,334	91,517	188,066
Sweltzer Creek	Oct. 15-18	6,874	751	6,224
Little Chilliwack Creek	——	68	0	0
Brown Creek	——	44	0	0
Slesse Creek	Oct. 15-20		317	55
Middle Creek	Oct. 12-15		528	434
TOTAL		812,981	205,037	385,838
GRAND TOTAL		2,424,867	1,078,000	1,094,105

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